

ORIGINAL

WHITE WATER ASSOCIATES, INC.

City of Crystal Falls Hydroelectric Project

(Project No. 11402)-037

Water Quality Monitoring Study

Annual Report for 2000 Monitoring

Submitted to:

The Secretary
Federal Energy Regulatory Commission
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888 First Street, NE
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With copies to Michigan Department of Natural Resources
(Jessica Mistak) and U.S. Fish and Wildlife Service (James Fossum)

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TABLE OF CONTENTS

INTRODUCTION	1
DESCRIPTION OF THE GENERAL AREA AND MONITORING SITES	2
METHODOLOGY	3
Upstream Water Quality Profiles	3
Upstream Temperature Monitoring	3
Downstream Dissolved Oxygen and Temperature Monitoring	4
Data Management and Analysis	4
FINDINGS	6
Upstream Water Quality Profiles	6
Upstream Temperature Monitoring	6
Downstream Dissolved Oxygen and Temperature Monitoring	7
Comparison Between Hourly Temperatures at Sites	9
DISCUSSION AND RECOMMENDATIONS	10

APPENDICES

APPENDIX A: Study Plan, Order, and Article 404

APPENDIX B: Map

APPENDIX C: Upstream Water Quality Profiles

APPENDIX D: Upstream Temperature Monitoring

APPENDIX E: Downstream Temperature Monitoring

APPENDIX F: Downstream Dissolved Oxygen Monitoring

APPENDIX G: Comparison Between Hourly Temperatures at Sites

APPENDIX H: Agency Comments to the Draft Annual Report for 2000 Monitoring

INTRODUCTION

This draft report describes Year 2000 results for the Water Quality Monitoring Study being conducted for the City of Crystal Falls (licensee) on the City of Crystal Falls Hydroelectric Project (FERC Project No. 11402) located on the Paint River in Crystal Falls, Michigan (Iron County). This study is being conducted to comply with the FERC order issued April 10, 1997 approving the licensee's Water Quality Monitoring Plan (Appendix A). The study is being conducted by an independent ecological consulting firm (White Water Associates, Inc.) under contract with the licensee, with oversight by the Michigan Department of Natural Resources (MDNR) and United States Fish and Wildlife Service (USFWS).

The Water Quality Monitoring Plan submitted by the licensee was prepared by its contractor Mead and Hunt (Appendix A). The FERC order on the plan modified the proposed two-year monitoring term to a three-year term. In addition, it set reporting schedules specifying that a final interim report, including copies of agency comments as well as any proposed modifications for subsequent years of the study, be filed with the FERC by February 15, 2001. The order also specified special reporting instances should water quality measurements fail to meet standards set by Article 404 (Appendix A).

This report is comprised of five principal sections, including this one (the Introduction). The next section will describe the general area of the hydroelectric project and the specific monitoring sites. The Methodology section describes four aspects of the study: (1) Upstream Water Quality Profiles, (2) Upstream Temperature Monitoring, (3) Downstream Dissolved Oxygen and Temperature Monitoring, and (4) Data Management and Analysis. The Findings section presents our observations and data collected from the field, and provides an analysis of the data. The Discussion section overviews the first year of monitoring and recommends how anticipated effort for the field season in subsequent years may be modified.

DESCRIPTION OF THE GENERAL AREA AND MONITORING SITES

The study area is composed of two sites: an upstream site at the upper outer end of the floating platform ("catwalk") from which the barrier net is suspended, and the downstream site below the dam on the west side (river right). Throughout this report, these sites are often referred to simply as upstream and downstream. (See Figure 1, Appendix B.)

Servicing the upstream site was reliable and convenient thanks to the floating platform. This substantial structure is composed of wooden rafts connected into two large floating limbs oriented at approximate right angles to one another. The limb that is oriented upstream-downstream is 84 feet long and the limb that is placed cross-current is 96 feet long. It is held in place by steel cables that are stretched between anchor points on the dam, island, and western shore. The inner corner of the two limbs, just outside the barrier net, was the upstream site for deploying water quality monitoring equipment and taking weekly profiles.

The downstream site was chosen for its security, remoteness, consistent depth, and relation to the dam. It was approximately 100 feet downstream. The study plan prepared by Mead and Hunt and referenced in the FERC order indicated that positions be approximately 500 feet above and below the dam. Convenience and security dictated that these distances be reduced; however, the intent of the plan held—to measure water quality parameters at proper depth, well above and below the dam. In addition, the downstream site corresponded with the location of past deployment of similar equipment, lending to historical comparisons.

The aptness of depths of the two sites for this study was supported by historical data. In 1992, White Water Associates conducted aquatic and terrestrial studies within the Crystal Falls project area as part of the relicensing requirements (Paint River Ecology and Water Quality Study, White Water Associates, 1992). Bathymetry measures at two-foot contours were conducted throughout the impoundment including the area of the barrier net. From that data, depth at the upstream deployment site was determined to be among the deepest locations of the impoundment (as specified by the plan describing the site selection for dissolved oxygen and temperature profiles) at around 14 feet or 4.5 meters. From similar experience, the depth of the downstream site was known to typically be from 3 to 4 feet (1 meter) during the study period.

METHODOLOGY

For the Water Quality Monitoring Study, we followed the study protocol outlined in the licensee's monitoring plan prepared by its contractor, Mead and Hunt, filed with the Commission in November 1996, as modified in the order approving the plan issued April 10, 1996 (Appendix A). This section details the methods we used for the 2000 component of the study under four subheadings: (1) Upstream Water Quality Profiles, (2) Upstream Temperature Monitoring, (3) Downstream Dissolved Oxygen and Temperature Monitoring, and (4) Data Management and Analysis.

Upstream Water Quality Profiles

Upstream water quality was measured by means of a portable YSI dissolved oxygen/temperature probe. The probe's cable was marked at 0.5-meter intervals, which were the intervals used for data collection. According to the plan and its approving order, measures were only required every meter. Measures of temperature and dissolved oxygen were taken on a weekly basis at the upstream site, from June 7 through October 1. Two additional profiles are scheduled for the month of February (2001), but due to their timing the results cannot be included in this year's report.

Upstream Temperature Monitoring

In addition to affording a location for water quality profiles, the upstream site was the point of deployment for a continuously monitoring temperature probe, a Ryan TempMentor II, programmed to record temperature hourly. The temperature probe was factory calibrated before the study. The probe and datalogger, joined in a buoyant plastic cannister, were suspended from a weighted chain about 6 feet (2 meters) in depth from the surface. Every week, when the site was visited for profiles, the probe was checked to make sure it was functioning properly, and at times data was downloaded via a laptop computer. The unit collected data from June 7 through September 30.

Downstream Dissolved Oxygen and Temperature Monitoring

Weekly visits coinciding with upstream profiles were scheduled to service the Hydrolab Datasonde 3 probe deployed below the dam. The unit was calibrated for dissolved oxygen according to manufacturer's directions every two weeks. The temperature probe was factory calibrated before the study. The datasonde was programmed to measure dissolved oxygen and temperature hourly, as well as several related and operational parameters. Standard service included calibration checks and downloading of data, as well as occasional programming for monitoring runs. Both lo-flow and standard membranes were used for the unit's dissolved oxygen probe. Two different datasondes were used during the course the study. Any interruptions in readings due to servicing were noted for purposes of data management and analysis. The units collected data from June 7 through September 30.

The downstream site was a steep scramble down a heavily wooded hillside adjacent to the hydroelectric facility, minimizing the opportunity for theft or destruction. For further protection, the unit was encased in an slightly oversized PVC tube with holes on the probe end, chained to a tree on the riverbank. Weights held either end of the tube down to prevent shifting.

Data Management and Analysis

Data collected from the weekly profiles were placed in an Excel spreadsheet table for purposes of presentation and graphing. Percent oxygen saturation was calculated from temperature and dissolved oxygen using a nomogram published in the 1975 book *Limnology* (Robert G. Wetzel, W.B. Saunders Co., Philadelphia); results were placed in the same table.

The upstream temperature probe requires special software to communicate and download data. The result is two files associated with each download: a data file (basically a long string of temperature measurements with no indication of time or date) and a header file (data manually entered in the tempmentor during setup and deployment, including the start time/date and interval). These two files together allowed preparation of Excel spreadsheet tables giving all hourly measurements of temperature, together with daily maximums, minimums, and averages. These results were graphed to show a line of points for daily average, with a vertical bar through each point giving the maximum and minimum readings for that day. The tables and graphs were formatted to display one month of data at a time.

The downstream dissolved oxygen and temperature probe was slightly more sophisticated in its data handling than the upstream probe. The unit's internal data files allowed storing date and time with each reading. Nonetheless, the data had to be arrayed in an Excel spreadsheet table for proper presentation, including calculation of daily averages, maximums, and minimums, and graphing. The graphs were the same format as those prepared for the upstream site. Any data loss due to servicing was noted on the spreadsheet. The results were formatted to display one month of data at a time.

A comparison of temperatures collected hourly at upstream and downstream sites was produced. First, a spreadsheet was created to show a long list of data points for the two sites. Second, the difference between downstream site and upstream site was calculated. Third, the resulting table was used to produce graphs, broken down by month, showing all the raw data. As an additional step, the differences were arrayed similarly to those tables and graphs previously described to present daily averages, maximums, and minimums of these differences.

As indicated in the study plan, computer data were provided to the agencies, MDNR and USFWS, as part of the submission for review. The format of the raw data presented certain limitations (for instance, the upstream monitor does not record date and time with the measurement). Also the fact that more than one unit and deployment bout were used during the course of the study made it difficult to discern how the individual files make up the data set, without reviewing detailed records of service activity. For convenience of the reviewer, we compiled all the raw data into a single "processed raw" data file for each location, appended date/time where necessary, and included any annotations useful to the reviewer. Besides these processed raw data files, the tabular and graphic presentations were also provided. The files provided at the review stage were all in Excel 2000 format. An accompanying README.XLS file described all the individual files making up that submission.

FINDINGS

In this section, we describe our findings regarding the four categories just described under Data Management and Analysis in the Methodology section.

Upstream Water Quality Profiles

Measurements of dissolved oxygen and temperature at 0.5-meter intervals were taken weekly starting June 7 and ending October 1. The results of those measures and subsequent calculation of percent oxygen saturation are presented in Appendix C. At no time was there any dissolved oxygen readings below 6.0 mg/L (the exceedence limit was 5.0 mg/L) even near the bottom of the 4-meter range in depths, and readings were usually substantially higher. Week-to-week variance was likely caused by normal variation in the field equipment, despite regular calibration. Temperature readings ranged with the depth, from surface depth highs of 25°C to bottom depth highs of 24°C; these readings compared to data from the remote temperature probe taken during the same time period.

Upstream Temperature Monitoring

Readings of the Ryan TempMentor, the unit responsible for upstream temperature measurements, were collected at a fixed depth of about 6 ft. (2 meters) rather than taken as a profile across the water column as described in the previous section. This along with the continuous hourly record allowed presenting and graphing all data points from its deployment June 7 through the end of the study September 30. The results are shown in tabular and graph forms for these four months (Appendix D). Monthly averages, maximums, and minimums are presented in the following table:

Upstream	Temperature (°C)		
Year: 2000	Average	Maximum	Minimum
June	19.3	21.7	17.4
July	20.6	24.0	16.7
August	20.9	24.2	18.1
September	15.4	20.5	10.7

Downstream Dissolved Oxygen and Temperature Monitoring

The Hydrolab Datasonde 3 responsible for downstream measurements recorded dissolved oxygen in addition to temperature. This record on a continuous hourly basis allowed presentation of the data, in tabular and graph form, from the unit's deployment June 7 through September 30. The results are shown for these four months in Appendix E (temperature) and Appendix F (dissolved oxygen).

Due to the servicing necessary to maintain this equipment, on several occasions units were out of the water during time programmed for readings because a site visit was in progress. These "missing" readings are represented as asterisks (*) in the data tables. Dates and times of these occasions are as follows: July 13 (1100), August 10 (1200), August 30 (1500).

Starting around July 19, the deployed datasonde unit began to show problems with increasingly high dissolved oxygen readings, roughly coinciding with a service visit that included a new set of batteries. In addition, a "bad" reading (9999) for dissolved oxygen occurred during this period, on July 23 (2300), for no reason except equipment failure; this generally occurs when a unit fails to acquire a dissolved oxygen reading in an allotted time. After servicing on July 25 (1400), when the problem was first noted, the unit performed somewhat better. To correct the problem, the poorly performing unit was replaced on July 27 (1100) with a new unit equipped with a standard membrane. Units equipped with lo-flow membranes, such as the replaced unit, are subject to degradation of the probe (anode) over long periods and sometimes suffer from power problems. Water flow was ample enough to ensure that a standard flow membrane would provide reliable readings. The switch to units equipped

with standard membranes solved the transitory problem of unrealistically high dissolved oxygen readings for the remainder of the deployment, as evidenced by readings in August falling within normal ranges. Monthly averages, maximums, and minimums for temperature and dissolved oxygen follow:

Downstream	Temperature (°C)		
Year: 2000	Average	Maximum	Minimum
June	19.5	22.1	17.6
July	20.9	24.7	16.9
August	21.1	24.5	18.3
September	15.6	20.9	10.8

Downstream	Dissolved Oxygen (mg/L)		
Year: 2000	Average	Maximum	Minimum
June	7.8	8.8	7.0
July	7.2	8.2	5.8
August	7.5	8.7	5.9
September	8.5	9.8	6.4

Data from July 19 through July 27 was not considered in the table for dissolved oxygen due to the service problem described. If it had been included the average would have been 8.0, and the maximum would have been 15.4. The minimum would have remained the same. The table and graph for July's dissolved oxygen measurements display all the data related to this episode.

Comparison Between Hourly Temperatures at Sites

Continuous hourly temperature readings upstream and downstream of the dam allowed the comparisons from hour to hour, day to day, and month to month included in this report. The data are presented in tabular and graph forms in Appendix G, for the four months involved. In addition to the daily averages, maximums, and minimums reported in those tables, the following is a table showing these differences compiled over a monthly basis:

	Delta Temperature °C (Downstream - Upstream)		
Year: 2000	Average	Maximum	Minimum
June	0.2	0.7	-0.9
July	0.3	1.5	-0.6
August	0.2	1.2	-0.8
September	0.2	1.0	-0.7

Delta temperature in this case means "downstream minus upstream" so a positive number indicates that the temperature downstream was higher than the temperature upstream. Looking at the averages in the previous table, it seems that unit(s) downstream tended to have higher readings (from 0.2 to 0.3°C) but differences of this magnitude could be due to variations in tunings of the factory-calibrated units. Swings in the positive direction never exceeded 1.5°C. Swings in the negative direction (i.e., temperature upstream higher than temperature downstream) were as great as -0.9°C. At no time, did the "downstream minus upstream" temperature difference exceed the delta standard of 5°C.

DISCUSSION AND RECOMMENDATIONS

Water quality measurements are within normal ranges expected of this study setting and time period. Dissolved oxygen and temperature profiles were typical, with both decreasing slightly with depth. Dissolved oxygen at both locations always measured well above the exceedence limit of 5.0 mg/L. Differences in readings for temperature upstream and downstream of the dam were low, less than 2°C, at all times. At times, the upstream site actually recorded higher readings than the downstream site. This could perhaps be due to rainfall events, diurnal sunlight patterns affecting the downstream site, or seasonal changes.

The weekly visits to service the downstream monitoring probe ensured that any maintenance, calibration, or exceedence problems were dealt with swiftly. (The plan submitted to and approved by FERC calls for calibration visits every two weeks and data download visits every week.) This year was a tune-up for the remaining term of the monitoring study. With the change from lo-flow to standard membranes for the dissolved oxygen probe, we have achieved greater stability in calibrations and reliability in readings.

The weekly visits for upstream profiles and downstream data download have been intensive for the level of problems found. Visits every two weeks for these tasks would be adequate to measure changes in conditions and ensure proper operation without risking large amounts of data loss. It is our recommendation that this schedule be adopted for next year's monitoring efforts.

Resulting from the draft report review and the recommendation given above, MDNR reviewer Jessica Mistak (Habitat Protection Unit, Fisheries Division) indicated by phone and correspondence the agency's acceptance of the previous recommendation regarding scheduled visits (Appendix H), with the stipulation that "bi-weekly downloading is appropriate only if no problems with data collection are encountered." Ms. Mistak also stated, "If problems such as unusual DO drift or non-compliance should occur, MDNR requests the licensee return to downloading data on a weekly basis." We agree with this stipulation and will proceed in this manner for monitoring in 2001.

APPENDIX A

Study Plan, Order, and Article 404

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Crystal Falls) Project No. 11402-013

ORDER APPROVING WATER QUALITY MONITORING PLAN

(Issued April 10, 1997)

City of Crystal Falls (licensee) filed for Commission approval, on November 19, 1996, and supplemented on November 20, 1996, a water quality monitoring plan. This plan is required by article 404 of the license for the Crystal Falls Project, issued on October 18, 1995. 1/ The project is located on the Paint River in Iron County, Michigan.

Article 404 requires the licensee to consult with Michigan Department of Natural Resources (MDNR) and the U.S. Fish and Wildlife Service (FWS) and develop a plan to monitor dissolved oxygen concentrations (DO) and water temperature levels at the project. 2/

LICENSEE'S PROPOSED PLAN

The licensee plans to monitor DO for two years in conjunction with implementation of the licensee's barrier net study. 1/ Specifically, the licensee proposes to continuously monitor water temperature and DO at mid-depth approximately 500 feet downstream of the dam and approximately 500 feet upstream of the impoundment (water temperature only) from June through September. One-meter increment profiles of water temperature and DO will be taken once a week from June through September and twice during the month of February for water temperature and DO.

The licensee plans to use Hydrolab DataSonde III probes for the water quality monitoring. Water temperature and DO will be

1/ 73 FERC ¶ 62,036. See also Order on Rehearing, issued on May 17, 1996 (75 FERC ¶ 61,174).

2/ State standards require a DO of at least 5 milligrams/liter (mg/l) and the waters downstream shall not receive a heat load that would warm the receiving water at the edge of the mixing zone by more than 5° F above natural water temperatures. Further, the Paint River shall not receive a heat load that would warm the receiving water at the edge of the mixing zone to temperatures greater than monthly maximums.

3/ This plan was approved in the Order Modifying and Approving Plan for the Installation and Monitoring of a Barrier Net, issued on May 10, 1996 (75 FERC ¶ 62,102).

Project No. 11402-013

-2-

recorded hourly during the monitoring period. The licensee plans to calibrate the continuous monitoring probes every two weeks during the monitoring period and the profile probes prior to each sample, according to manufacturer's instructions.

The licensee plans to download DO and water temperature data weekly. At this time, the data will be reviewed to determine if a deviation from state standards has occurred. If a deviation in DO or water temperature occurs, the licensee plans to inform the agencies immediately and determine what, if any, mitigative measures are necessary. If additional measures are implemented, the licensee plans to download data daily to more closely monitor changes in water quality in response to the measures implemented. In the event of DO falling below state standards, the licensee plans to increase spillage. If water temperature standards are exceeded, the licensee plans to immediately contact the agencies to determine what, if any, measures can be taken.

The licensee plans to submit a report to the agencies and to the Commission each year of the two-year monitoring period. This report would include DO and water temperature daily averages, minimum and maximums, and DO and water temperature profile data. The report would also provide comparisons between upstream and downstream water temperature. If at no time within the two-year monitoring period the water quality standards have been exceeded, the licensee will consider the project to have no adverse effect on water quality and will discontinue the monitoring.

AGENCY COMMENTS

The MDNR commented on the proposed plan in a letter dated April 1, 1996. The FWS did not provide comments on the proposed plan.

The MDNR recommends the monitoring period extend from May-October for at least three years. After three years, the licensee may request to change the frequency of monitoring. The MDNR also recommends that water temperature be monitored continuously given that violations could occur in any season. Monitoring locations should be selected in consultation with MDNR.

The MDNR requests that all monitoring equipment be validated with an independent measurement system such as a National Bureau of Standards thermometer for temperature and a Winkler analysis for DO at the end of each unattended monitoring period. Further, 70 percent of the DO data should be verified as accurate to within 1 milligram/liter (mg/l) of the true DO value. Weekly service visits should be scheduled for quality assurance. Further, the MDNR suggests a real-time evaluation of the data to provide for immediate detection of a deviation from state standards.

Regarding reports, the MDNR requests that DO values be compared hourly to the state DO standard and delta temperature values be compared instantaneously. Plausible explanations for any deviations should be provided in the reports, along with a description of the effectiveness of any measures implemented to improve water quality. The MDNR also requests quarterly transmittals of raw data along with information pertaining to the calibration of equipment during that quarter.

Other comments by MDNR were incorporated into the licensee's proposed plan.

DISCUSSION

The licensee's proposed water quality monitoring plan includes those requirements stipulated in article 404 of the license. Implementation of the proposed plan should enable the licensee to monitor the effects of project operation on water temperatures and DO. Calibration of the monitoring equipment according to manufacturer's recommendations, as proposed by the licensee, should be adequate to ensure accurate data are collected. To the extent practicable, the licensee should choose monitoring locations in coordination with the MDNR and FWS.

Article 404 of the license states the purpose of the plan is to ensure that water quality below the project, as measured immediately downstream of the project tailrace, maintain the Michigan standards for DO and water temperature. Further, article 404 requires the licensee develop operating procedures to address when deviations from state standards occur.

Monitoring from June-September, as proposed by the licensee, encompasses the period when warmer temperatures are expected, thus affecting low DO. Therefore, deviations from state standards should be detected upon implementation of the licensee's proposed plan. However, monitoring for only two years, as proposed by the licensee, will not meet the purpose of the plan. Article 404 requires monitoring to ensure state water quality standards are met. The licensee cannot meet this goal if monitoring is discontinued.

Commission staff acknowledges that water quality data collected prior to licensing indicate project operations do not result in violations of the state water quality standards. 4/ If after implementation of monitoring, the data still indicates that project operations do not adversely affect water quality in the project area, the licensee may file a request to modify the water

4/ See the Environmental Assessment for Application for License for the Crystal Falls Project, issued on October 18, 1995 (73 FERC ¶ 62,036).

quality monitoring plan, as recommended by the MDNR. Any recommendations to amend the water quality monitoring plan should be filed for Commission approval, as discussed below.

Providing annual reports to the agencies and immediately contacting the FWS and MDNR upon detection of any deviation from the state standards, as proposed, should provide the agencies with the results of the monitoring in a timely manner. These reports should include, to the extent possible, explanations for any deviations and the effectiveness of any measures implemented to improve water quality, as recommended by MDNR. Quarterly reports of water quality data, as requested by MDNR, are not necessary. The licensee did not provide a schedule for submitting these reports to the agencies or to the Commission. The licensee should provide annual report(s) to these agencies by December 15 of each year of monitoring.

It is only necessary to provide the annual report to the Commission for the first three years of monitoring. Our review of the annual report for a three year period will allow us to evaluate water quality during project operations. The annual report to the Commission should be filed by February 15 of the year following monitoring. The filing should include agency comments, the licensee's response to agency comments, and any recommendations, for Commission approval, for modifying or discontinuing water quality monitoring. Each agency should be given 30 days to comment. If there are no changes to the water quality monitoring plan, the licensee should continue to provide the annual reports to the consulted agencies as identified in the licensee's proposed plan. So that the Commission can monitor compliance with article 404, the licensee should notify the Commission of any deviation from the state standards for DO and water temperature.

The MDNR recommends the licensee analyze data in real time to immediately determine if a problem in water quality exists. The licensee proposes to retrieve data biweekly. Given that the available data indicates no existing water quality problems, as discussed above, the licensee's schedule appears adequate. Further, when the licensee does detect a problem, the licensee plans to retrieve data daily, after contacting the agencies to determine what measures should be implemented in efforts to improve water quality. Therefore, the licensee can timely note any improvements in water quality resulting from any measures implemented.

The licensee proposes to consult with the FWS and MDNR to determine what measures are appropriate in efforts to improve water quality. The licensee specifies that the most likely measure to improve DO is to increase spill. This should be adequate. However, if additional measures are necessary, or if the parties disagree on which measures are appropriate, the

Commission should determine which, if any, additional measures are necessary to improve water quality.

The licensee's water quality monitoring plan, with the modifications discussed, should be adequate to monitor the requirements of article 404 and should be approved.

The Director orders:

(A) The licensee's water quality monitoring plan, filed with the Commission on November 19, 1996, and supplemented on November 20, 1996, as modified in paragraph (B), is approved.

(B) The licensee shall monitor dissolved oxygen concentrations and water temperature at the project for the remainder of the license term. The licensee shall file annual reports with the Commission for the first three years of monitoring. These reports shall be filed by February 15 of the year following monitoring and shall include agency comments, the licensee's response to agency comments, and any recommendations, for Commission approval, on modifying the water quality monitoring plan.

(C) If DO or water temperature, as measured by the approved monitoring system, falls below that required by article 404, the licensee shall file a report with the Commission within 30 days of the date the data becomes available indicating an incident has occurred. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include: (1) operational data necessary to determine compliance with article 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission shall reserve the right to require modifications to project facilities and operations to ensure future compliance.

(D) Unless otherwise directed in this order, the licensee shall file an original and seven copies of any filing required by this order with:

The Secretary
Federal Energy Regulatory Commission
Mail Code: DLC, HL-11.2
888 First Street, NE
Washington, DC 20426

In addition, the licensee shall serve copies of these filings on any entity specified in this order to be consulted on matters related to these filings. Proof of service on these entities shall accompany the filings with the Commission.

(E) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to CFR § 385.713.


Kevin P. Madden
Acting Director
Office of Hydropower Licensing

A Plan for Monitoring Dissolved Oxygen and Temperature Levels in the Paint River in the vicinity of the Crystal Falls Hydroelectric Facility

Introduction

On October 18, 1995, the Federal Energy Regulatory Commission issued a license for the City of Crystal Falls to continue to operate and maintain the 1,000-kilowatt Crystal Falls Hydroelectric Project, No. 11402, located on the Paint River in Iron County, Michigan. This license is subject to various articles. Among those articles, Article 404 specifies that "Within 6 months of the license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project. This report is intended to provide the plans for implementation of the DO and temperature monitoring program in accordance with Article 404.

Article 404 of the Commissions' license, requires that the water quality data (DO and temperature) would be compared to Michigan State water quality standards. According to these standards (R323.1041), the Crystal Falls hydroelectric project should not influence DO or temperature beyond specified limits as follows: a DO of at least 5 mg/l should be maintained; and a heat load shall not be received that would warm the waters at the edge of the mixing zone by more than 5°C above natural water temperatures, or greater than monthly maximums.

A draft plan for monitoring DO and temperature was prepared and forwarded to the appropriate resource agencies for review in February, 1996. The Michigan Departments of Natural Resources and Environmental Quality prepared a joint reply and the Fish and Wildlife Service concurred with their comments – these entities are hereinafter referred to as the "Agencies." A copy of the draft plan, and the Agencies' comments are attached. The draft plan intended to monitor dissolved oxygen and temperature in the Crystal Falls impoundment and at a downstream location only during the times when the activities related to the proposed Barrier Net Effectiveness Study would be in operation. This allowed the city to combine efforts and maintain study costs for water quality monitoring to within the FERC's proposed \$15,000 cost estimate (FERC Environmental Assessment, page 65). This original plan has been substantially revised as follows to reflect the Agencies' comments and due to the fact that the original Barrier Net Effectiveness Study plan has also been substantially revised.

Study Plan

We propose to continuously monitor both temperature and DO in a mid-depth placement approximately 500 feet below the dam in the Paint River during the months of June through September. Additionally, temperature will be continuously monitored at a mid-depth placement in the Paint River approximately 500 feet upstream of the Crystal Falls impoundment area. A one-meter-increment profile of temperature and DO will be obtained from the deepest part of the impoundment once a week during the months of June through September, and twice during the month of February.

The water quality monitoring plan is proposed to take place in conjunction with the Barrier Net Effectiveness Plan. That is, the site visits used to perform weekly fisheries studies for the effectiveness of the barrier net would be also used to download and recalibrate the continuous monitoring probes, and to conduct weekly profiles of the impoundment. Thus, it is proposed to conduct the water quality monitoring plan during the same two years that are proposed for the Barrier Net Effectiveness Study.

Monitoring Equipment

We propose to use Hydrolab DataSonde III probes for temperature and DO monitoring. The probes would be calibrated according to the manufacturers recommended procedure every two weeks throughout the continuous monitoring period. The continuous monitoring probes would be recalibrated bi-weekly throughout the deployment period and the profiling probe would be calibrated prior to each sample.

Schedule

Continuous monitoring would record temperature and DO hourly during the deployment period. The profile of the impoundment would produce instantaneous data. It is proposed to conduct water quality monitoring for a period of two years. If at no time within this two year period the water quality standards have been exceeded the Crystal Falls Hydroelectric Project should be considered as not having the potential to violate state water quality standards and water quality monitoring would be discontinued. If, however, at any time during the monitoring period, water quality standards are substantially exceeded, the applicant shall inform the Agencies of the deviation from the established limits and, in consultation with the Agencies, the applicant may modify the water sampling procedures to more closely verify the extent and source of the water quality problem and success of any mitigation procedure.

Reporting and Compliance

It is intended to download temperature and DO data from the continuous monitoring

probes weekly throughout the deployment period. At each download, it will be determined if there has been a violation of the water quality standards during the preceding week, and if this violation is still occurring; if so, the Agencies would be immediately notified by telephone and procedures to mitigate the violation would be attempted. If there is a violation of the 5 mg/L dissolved oxygen level at the downstream location, it is proposed that the most likely procedure would be to implement spillage from the impoundment surface waters to aerate the water below the dam. If this plan is invoked, the downstream dissolved oxygen levels would be downloaded daily to monitor the success of this effort. The amount of spillage would be modified according to the success of this effort in increasing the DO as determined by the daily monitoring. The Agencies would be kept apprised of this effort. We have no plan, nor has the Agencies offered a solution, to mitigate any violation of the Delta Temperature Standard. It is proposed to report any violation of the Delta Temperature Standard to the Agencies immediately upon its discovery and at that time determine what, if any, solution might exist to the problem.

In addition to the above reporting procedures, we would prepare an annual report to the FERC and the Agencies. This report would include a computer diskette with all raw data from the continuous and weekly monitoring efforts. In addition to the raw data, a summary of the data by daily average, minimum, and maximum DO, and temperature at the continuous monitoring sites and weekly profiles from the impoundment would be provided. This report would also include an upstream/downstream comparison of the Temperature Delta Standard.

Agency Comments

The agency recommendations have been accommodated into our revised plan as follows:

a) Monitoring locations and equipment. We have added a site upstream for temperature measurements. We intend to calibrate our probes according to the manufacturers recommended procedure. We do not understand their request for a 70% data quality goal – all continuous monitoring probes would be recalibrated bi-weekly regardless of their accuracy to a calibration standard. We have agreed to monitor at one-meter intervals within the deepest part of the impoundment once a week from June through September.

b) Monitoring Schedule. We propose to monitor temperature and DO only during the months of June through September. It is unlikely that DO would be less than 5 mg/L during May or October and continuous monitoring during winter months is not feasible due to extreme weather conditions which would make access and equipment malfunctioning a problem. We will agree to provide a temperature and DO profile of the impoundment twice during the month of February to determine if there exists a potential for ice cover to deplete DO within the impoundment during the period of this event's greatest likelihood.

c) Data Reporting. We propose to provide an annual report to the FERC and the Agencies. This report would include a computer diskette of all raw data and a graphical and tabular presentation of daily minimum, maximum, and average temperature and DO values as measured during the previous year. This report will also note any violations of the Delta Temperature Standard or DO violations and rationale for any lapses in the data. We do not propose to measure any other water quality parameters as suggested such as stream flow, chlorophyll level, or instream chemistry. We do not understand what is meant by the recommendation for "instantaneous" comparisons of temperature values.

d) Detection and Notification. Data would be downloaded weekly from the continuous monitoring probes (at the time of the weekly temperature/oxygen profile of the impoundment). The comment of the Agencies seems to suggest that an hourly downloading and reporting is preferred but we do not understand how this is possible. Other than the annual report described above, no other reports would be made to the agency unless there is a recorded violation of the water quality standards. If such a violation in either the Delta Temperature Standard or the 5 mg/L DO limit is found, then the Agencies would be immediately notified by telephone and a remediation or mitigation procedure would be invoked. We would, as suggested, notify both the Chief of Surface Water Quality Division of the Michigan Department of Environmental Quality, and the FERC Program Manager for the Michigan Department of Natural Resources within one working day of any detected water quality standard violations.

e) Mitigative measures. If water quality standards are violated we intend to notify and work with the Agencies to mitigate those violations. The exact nature of the mitigation measure would depend upon the significance of the violation and the environmental conditions contributing to or otherwise affecting the ability of the applicant to remediate or mitigate the violation.

f) Initial monitoring period. We disagree with the requirement for long term monitoring. An initial period of two years should be adequate to assess whether there exists the potential for significant effects of the hydropower facility on the Paint River water quality. Furthermore, the FERC Environmental Assessment concluded that the water quality monitoring plan should cost about \$15,000. It is our estimate that the plan we have proposed will somewhat exceed that estimate. To extend the monitoring plan beyond two years would substantially and unreasonably exceed that estimate. Extended monitoring is regarded as necessary only if the initial two-year monitoring indicates that there is potential for significant water quality degradation from the hydropower operations that warrant further monitoring to develop and/or monitor long-term mitigation measures.

Article 104. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project.

The purpose of this monitoring plan is to ensure that streamflows below the project, as measured immediately downstream of the project tailrace, maintain the Michigan standards for DO concentration and temperature.

The monitoring plan shall include provisions for (1) monitoring of DO concentrations and temperature levels in the impoundment and downstream, with sensor locations and sampling frequently determined in consultation with the Michigan Department of Natural Resources (MDNR) and the U.S. Fish and Wildlife Service (FWS); and (2) the preparation of operating procedures developed in consultation with MDNR and FWS to address water quality conditions which deviate from the above limits.

The Licensee shall prepare the plan after consultation with MDNR and FWS. The water quality monitoring plan shall include a schedule for:

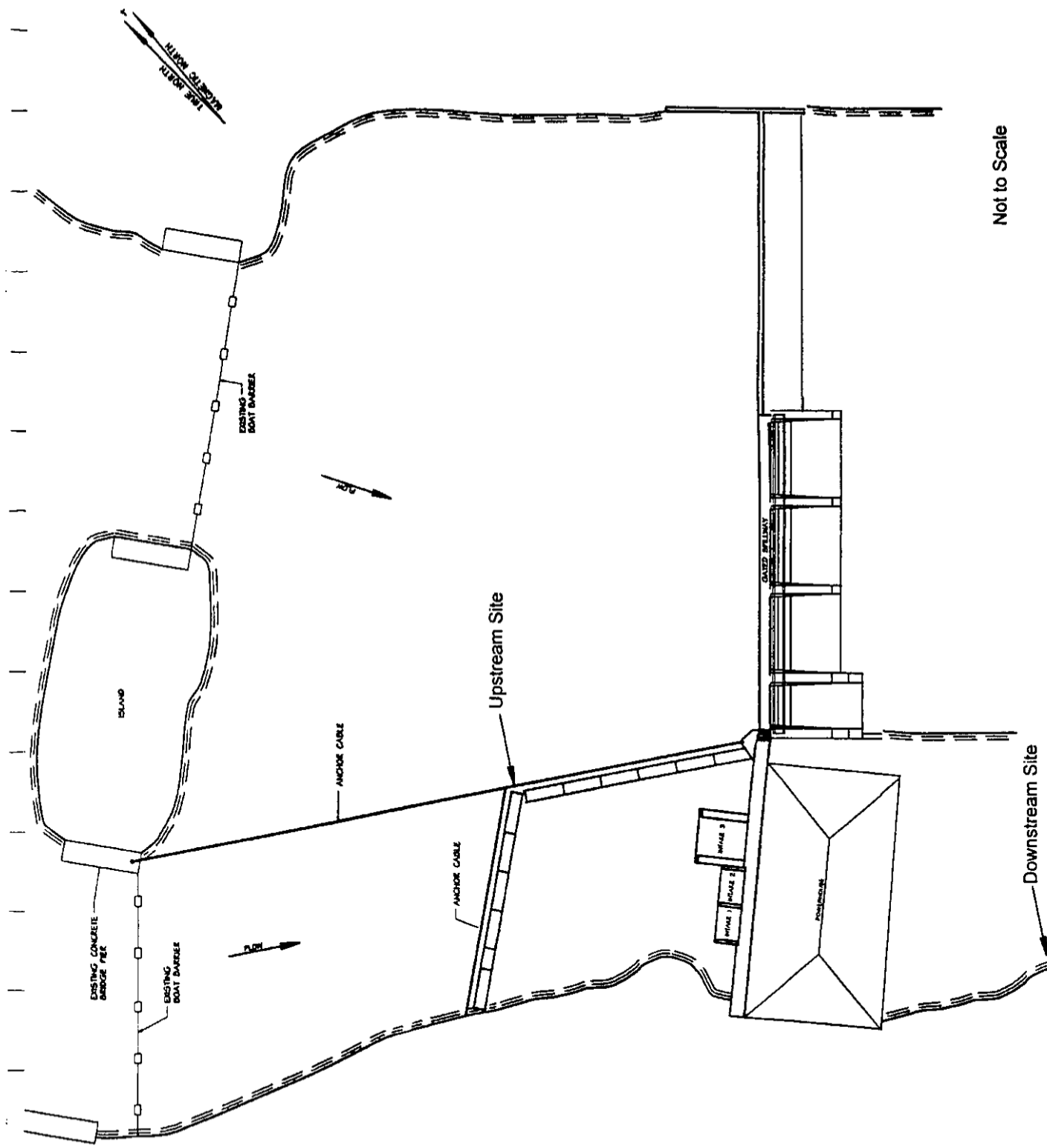
- (a) implementation of the program within 24 months from the date of issuance of this license;
- (b) consultation with MDNR and FWS concerning the results of the monitoring; and
- (c) filing the requests, agency comments, and Licensee's response to agency comments with the Commission.

The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The Licensee shall allow a minimum of 30 days for the agencies to comment and make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the DO concentration and temperature monitoring plan, including any changes required by the Commission.

APPENDIX B

Map



Not to Scale

Source: Modified from
Mead & Hunt,
Consulting Engineers,
Madison, Wisconsin

FIGURE: Map of Water Quality Monitoring Sample Points

APPENDIX C

Upstream Water Quality Profiles

**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

June 7, 2000

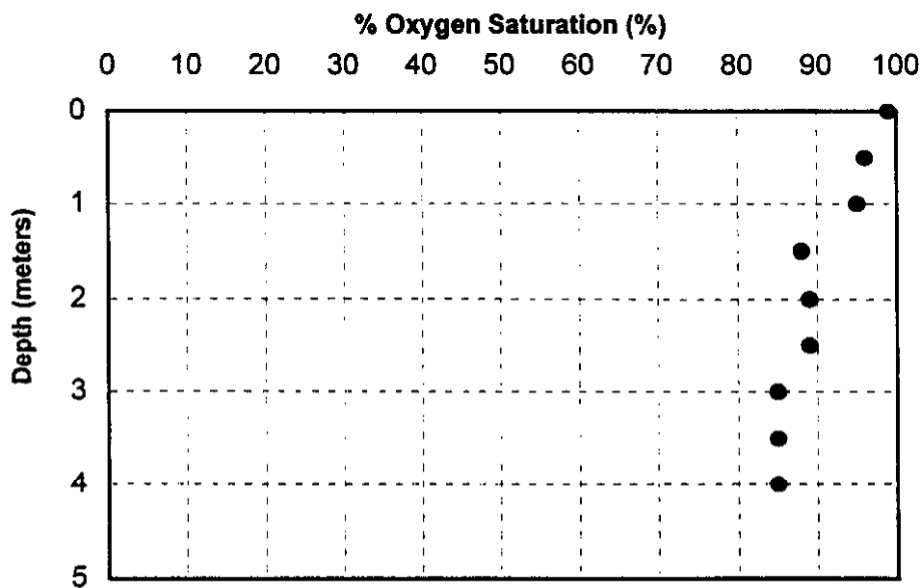
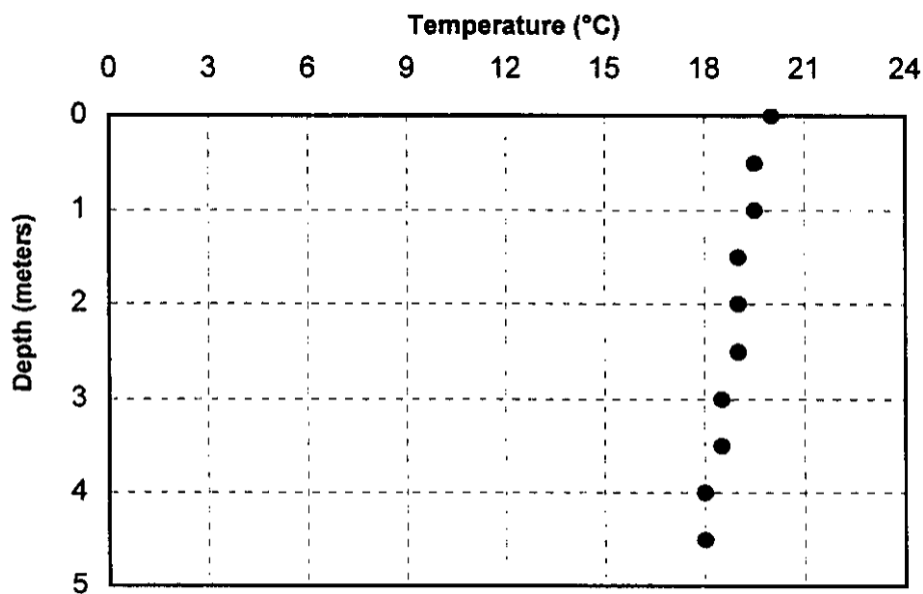
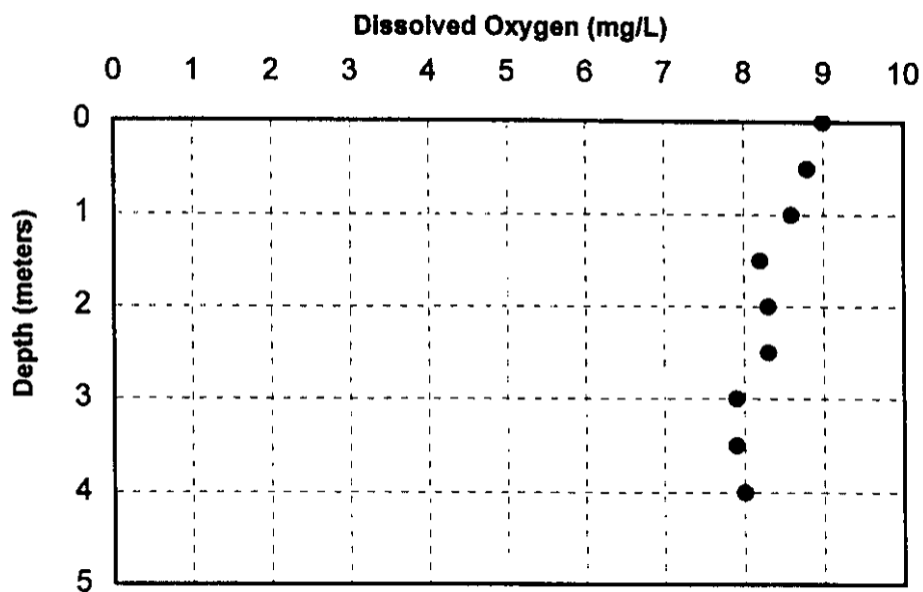
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	9.0	20.0	99
0.5	8.8	19.5	96
1.0	8.6	19.5	95
1.5	8.2	19.0	88
2.0	8.3	19.0	89
2.5	8.3	19.0	89
3.0	7.9	18.5	85
3.5	7.9	18.5	85
4.0	8.0	18.0	85
4.5		18.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

June 7, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

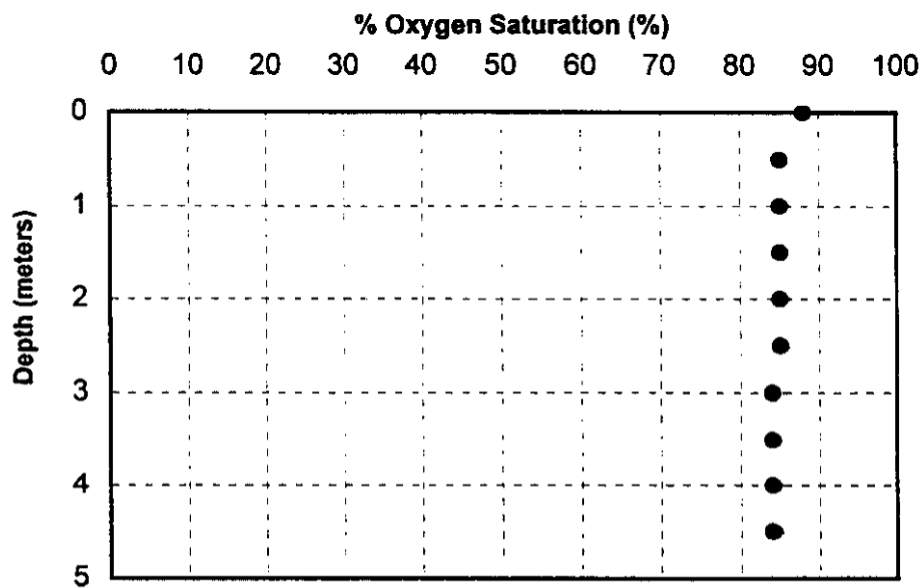
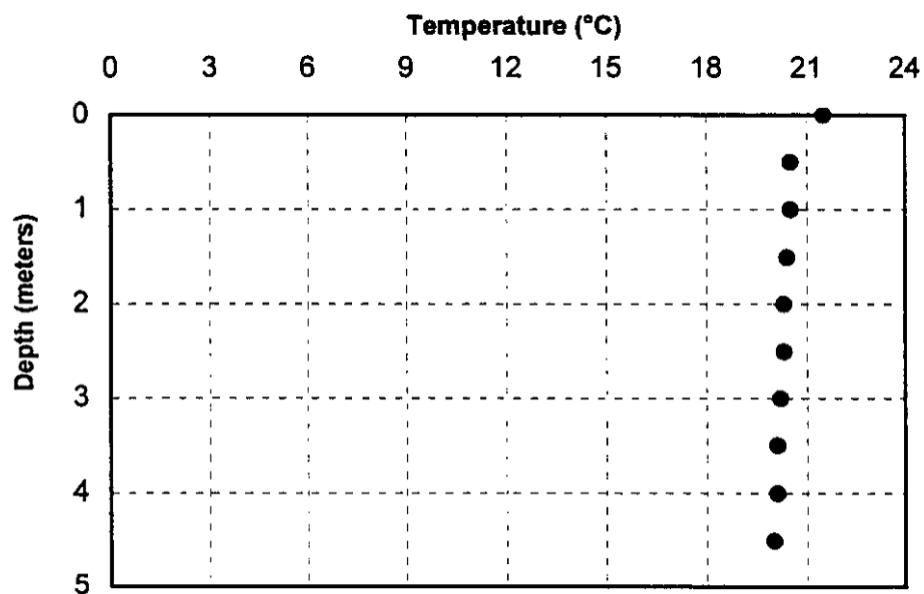
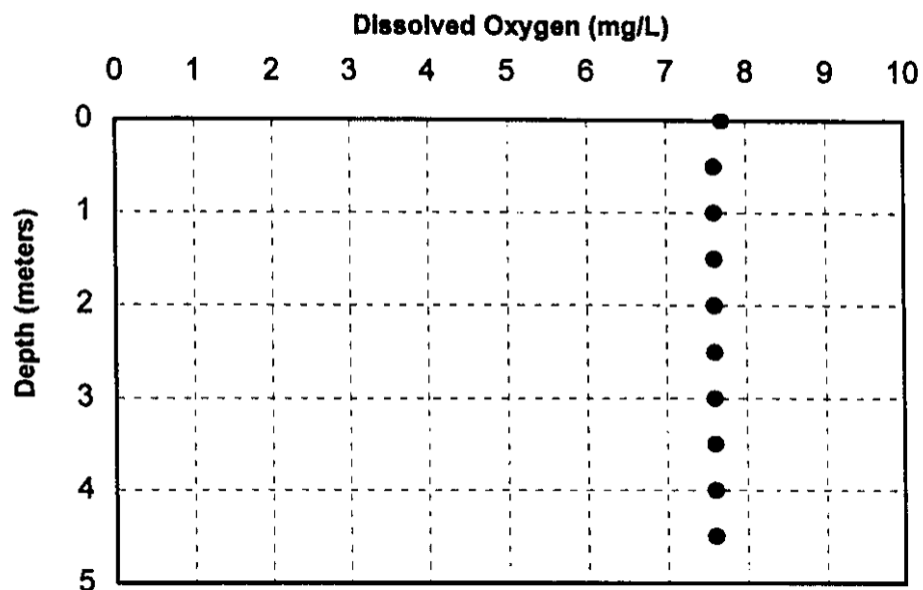
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
June 14, 2000	0.0	7.7	21.5	88
	0.5	7.6	20.5	85
	1.0	7.6	20.5	85
	1.5	7.6	20.4	85
	2.0	7.6	20.3	85
	2.5	7.6	20.3	85
	3.0	7.6	20.2	84
	3.5	7.6	20.1	84
	4.0	7.6	20.1	84
	4.5	7.6	20.0	84

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

June 14, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

June 21, 2000

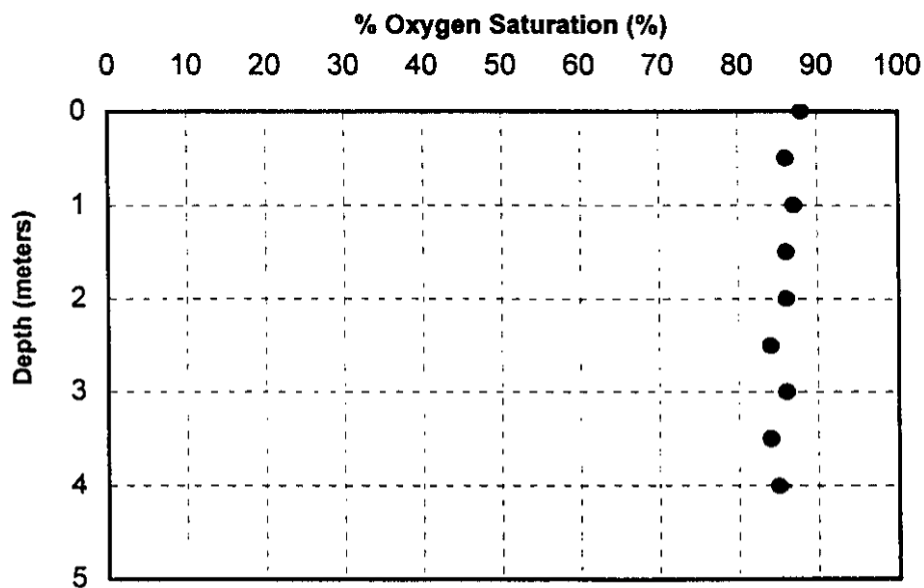
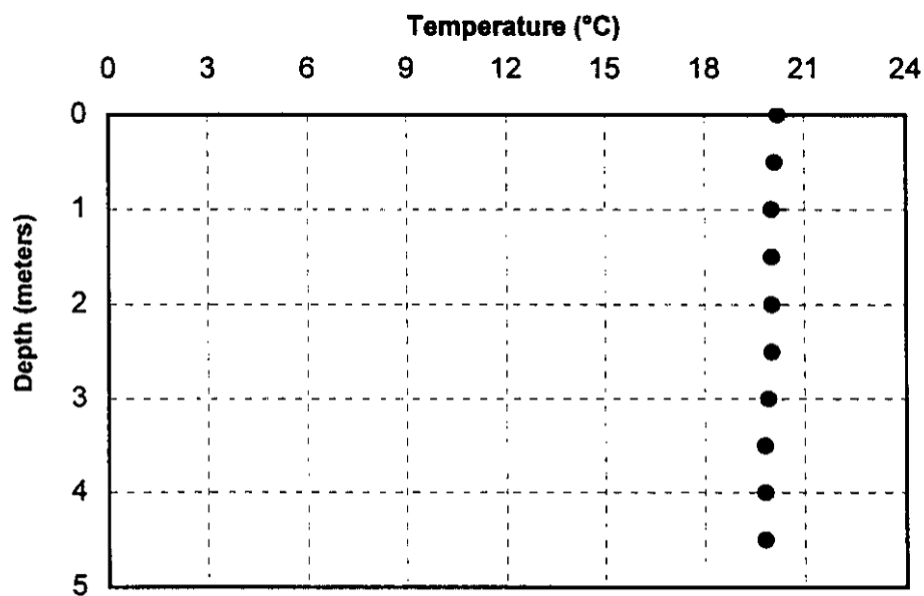
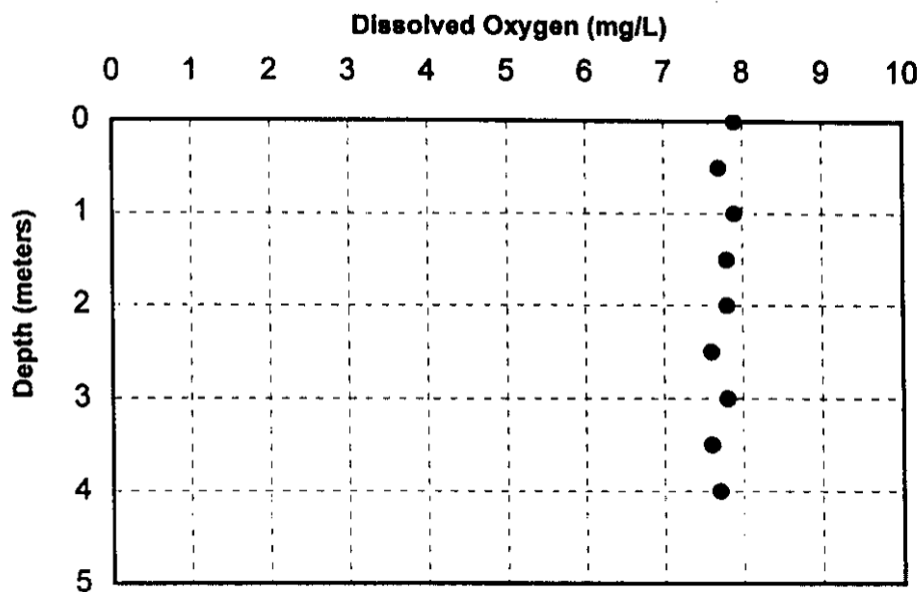
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	7.9	20.2	88
0.5	7.7	20.1	86
1.0	7.9	20.0	87
1.5	7.8	20.0	86
2.0	7.8	20.0	86
2.5	7.6	20.0	84
3.0	7.8	19.9	86
3.5	7.6	19.8	84
4.0	7.7	19.8	85
4.5		19.8	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

June 21, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

June 28, 2000

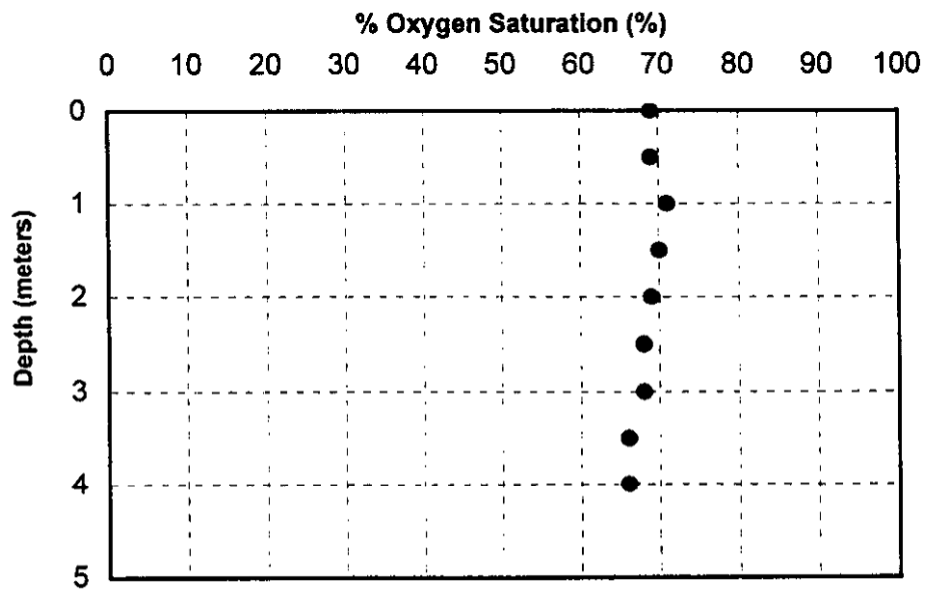
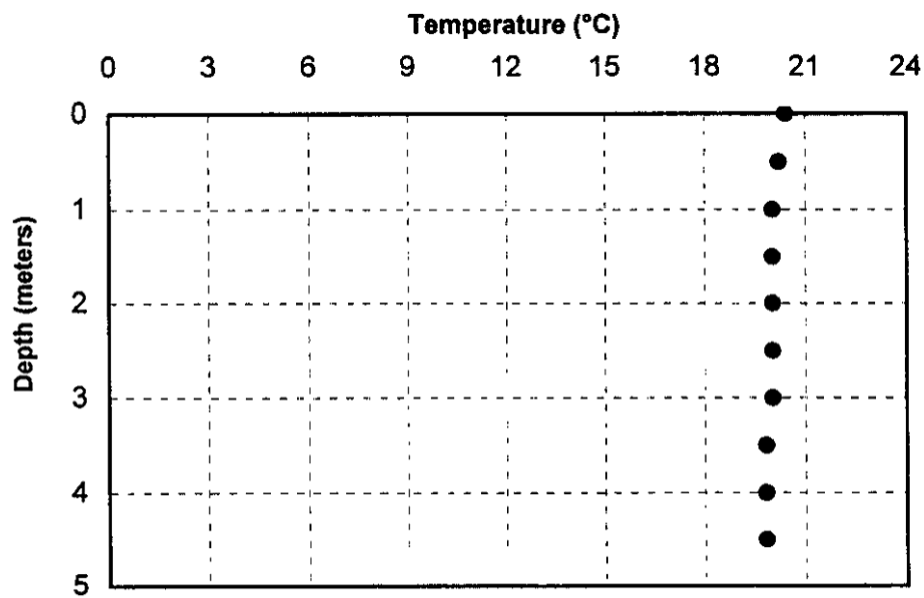
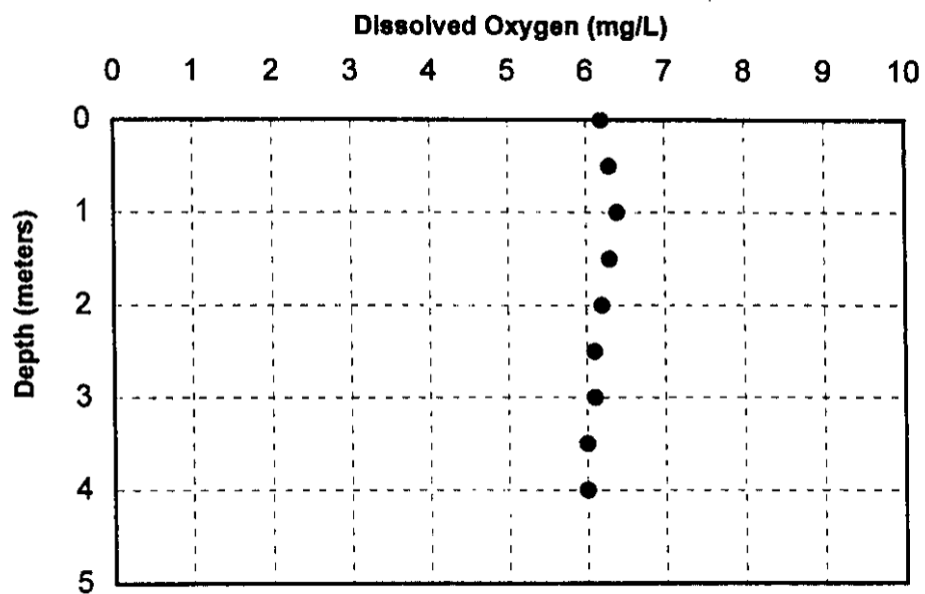
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	6.2	20.4	69
0.5	6.3	20.2	69
1.0	6.4	20.0	71
1.5	6.3	20.0	70
2.0	6.2	20.0	69
2.5	6.1	20.0	68
3.0	6.1	20.0	68
3.5	6.0	19.8	66
4.0	6.0	19.8	66
4.5		19.8	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

June 28, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

July 5, 2000

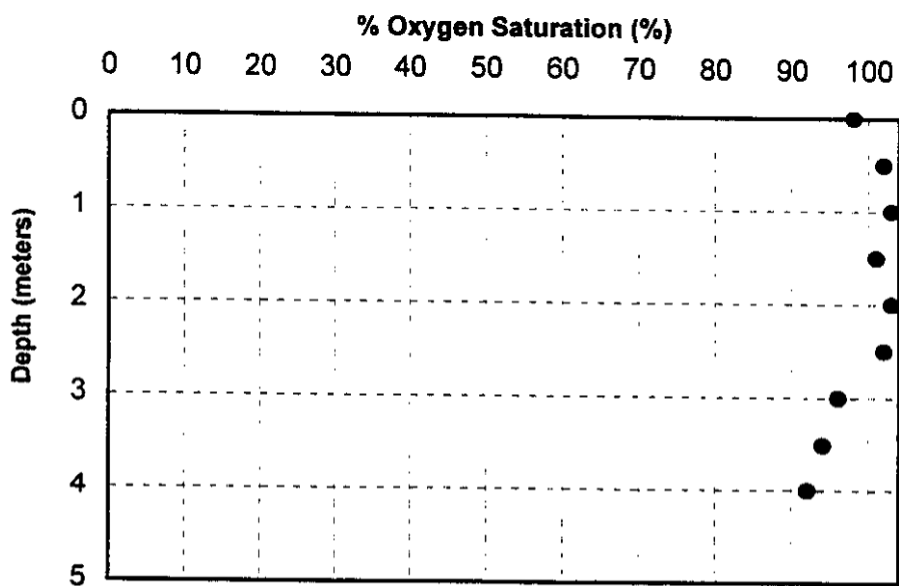
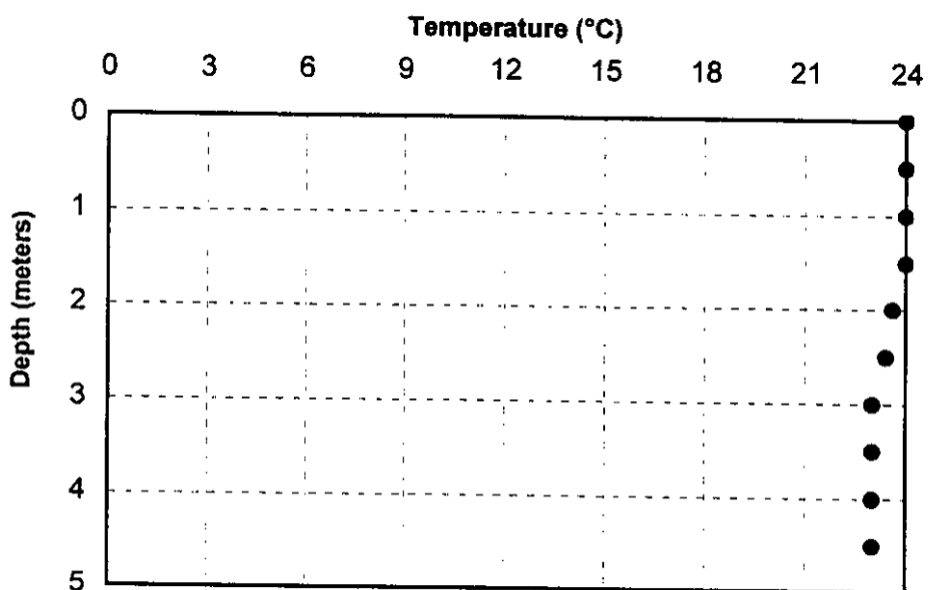
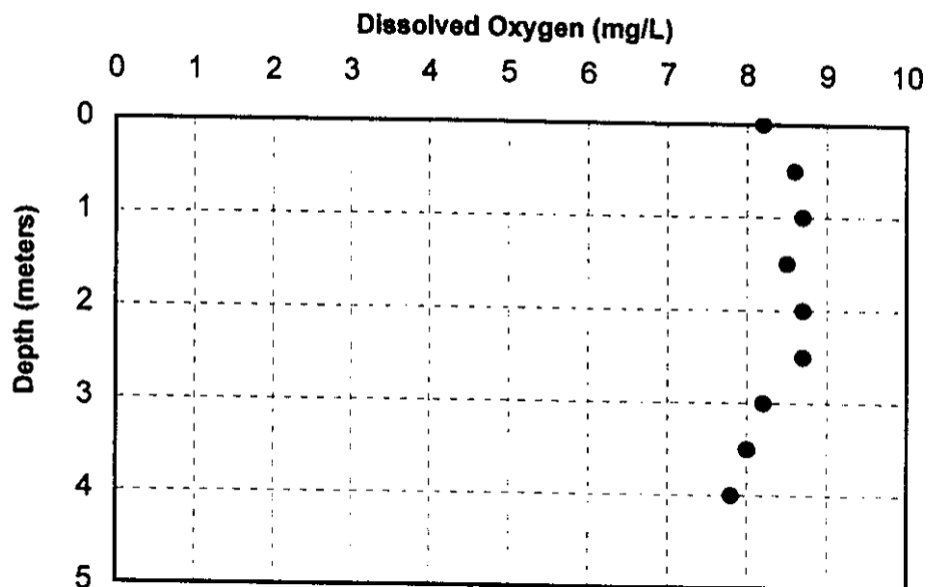
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.2	24.0	98
0.5	8.6	24.0	102
1.0	8.7	24.0	103
1.5	8.5	24.0	101
2.0	8.7	23.6	103
2.5	8.7	23.4	102
3.0	8.2	23.0	96
3.5	8.0	23.0	94
4.0	7.8	23.0	92
4.5		23.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

July 5, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

July 13, 2000

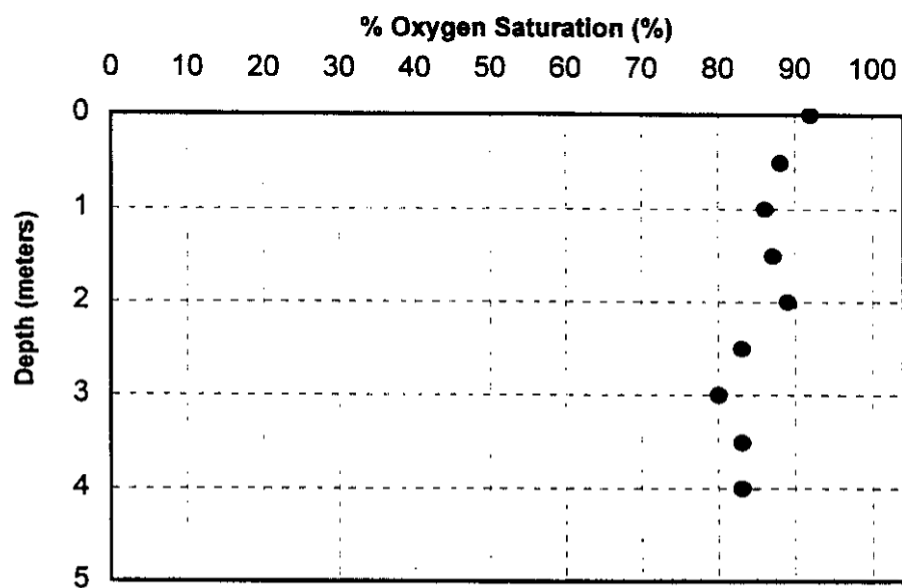
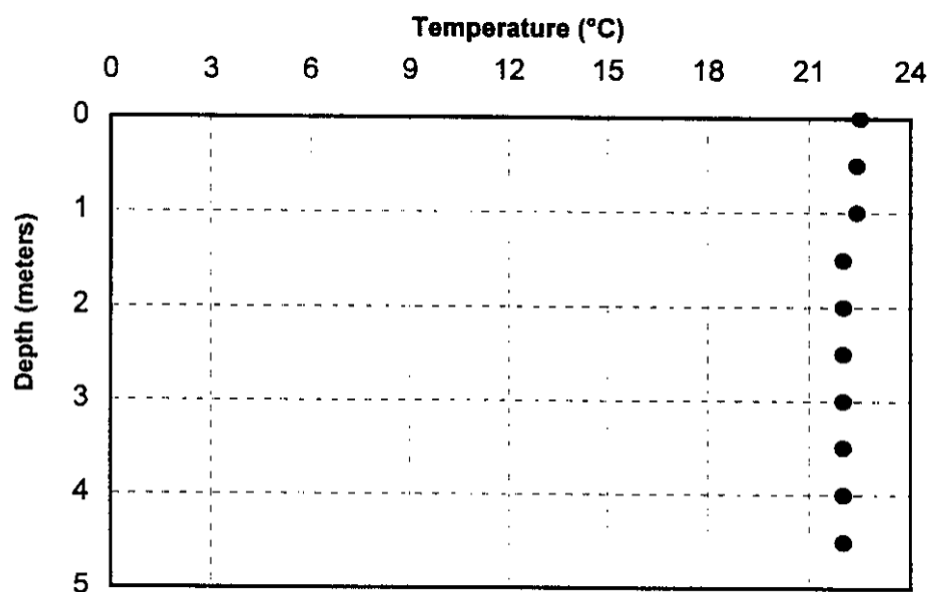
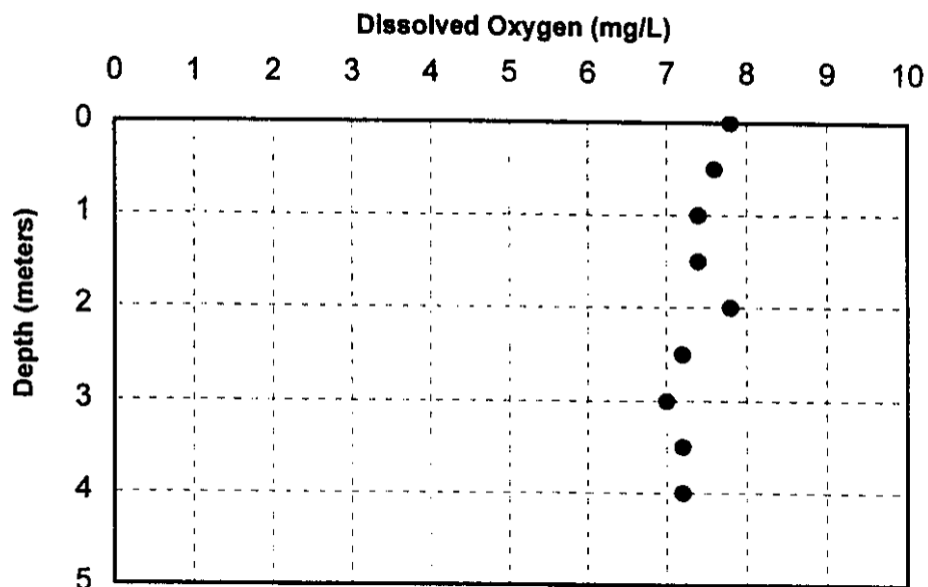
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	7.8	22.5	92
0.5	7.6	22.4	88
1.0	7.4	22.4	86
1.5	7.4	22.0	87
2.0	7.8	22.0	89
2.5	7.2	22.0	83
3.0	7.0	22.0	80
3.5	7.2	22.0	83
4.0	7.2	22.0	83
4.5		22.0	

Blank cells indicate DO reading was not possible (at bottom).

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Project**

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July 13, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

July 19, 2000

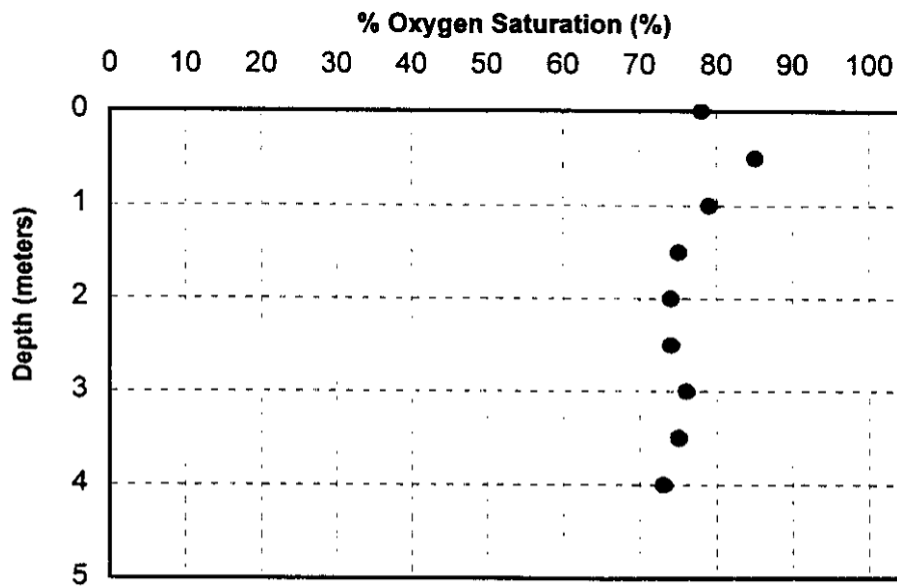
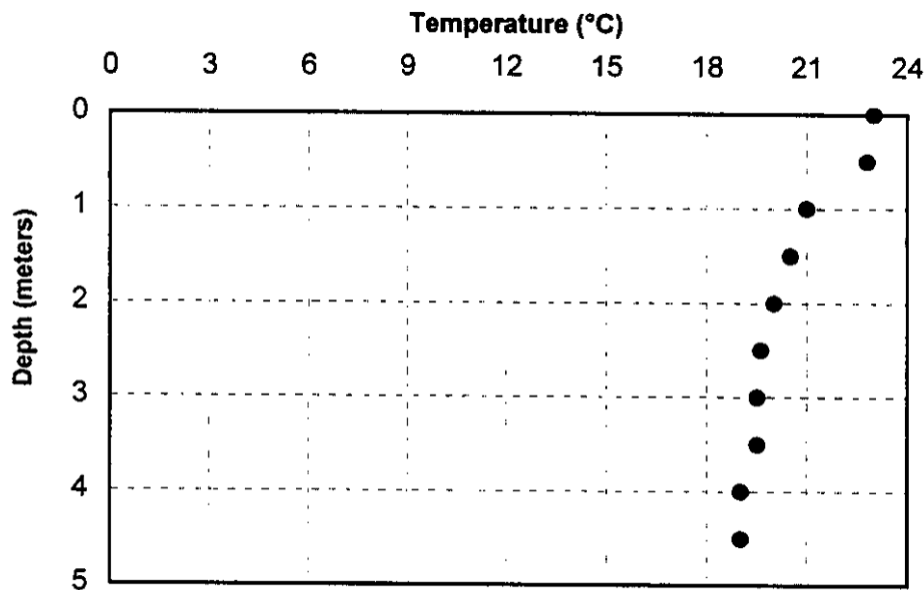
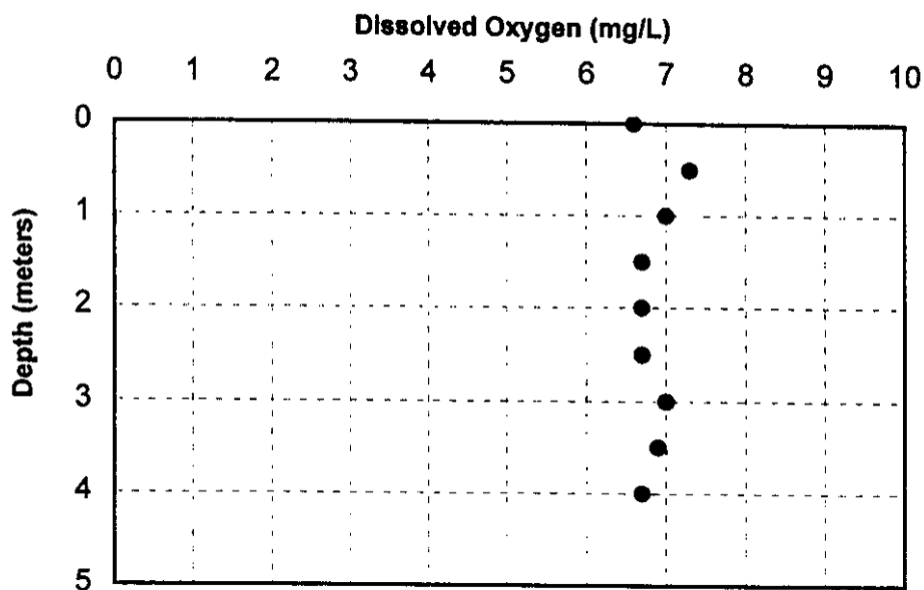
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	6.6	23.0	78
0.5	7.3	22.8	85
1.0	7.0	21.0	79
1.5	6.7	20.5	75
2.0	6.7	20.0	74
2.5	6.7	19.6	74
3.0	7.0	19.5	76
3.5	6.9	19.5	75
4.0	6.7	19.0	73
4.5		19.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

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Profiles**

July 19, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

July 25, 2000

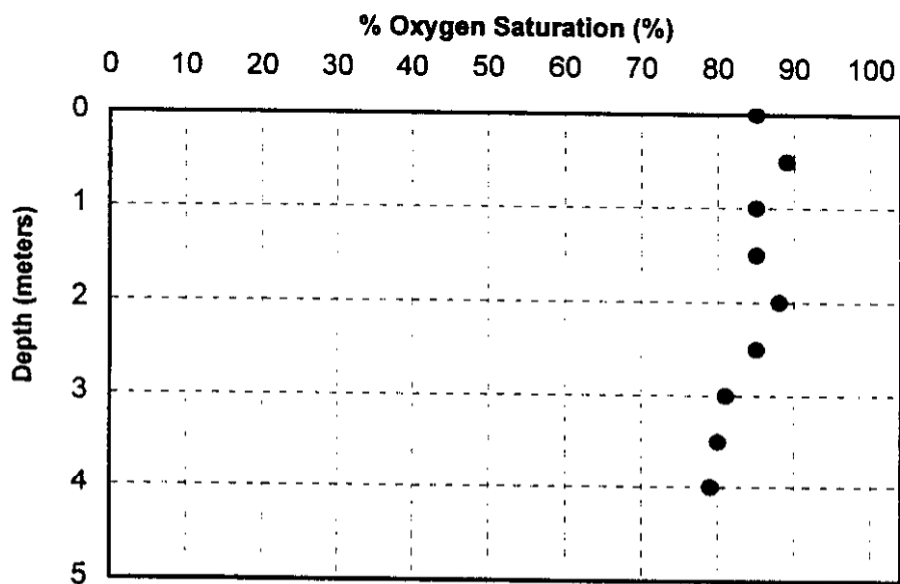
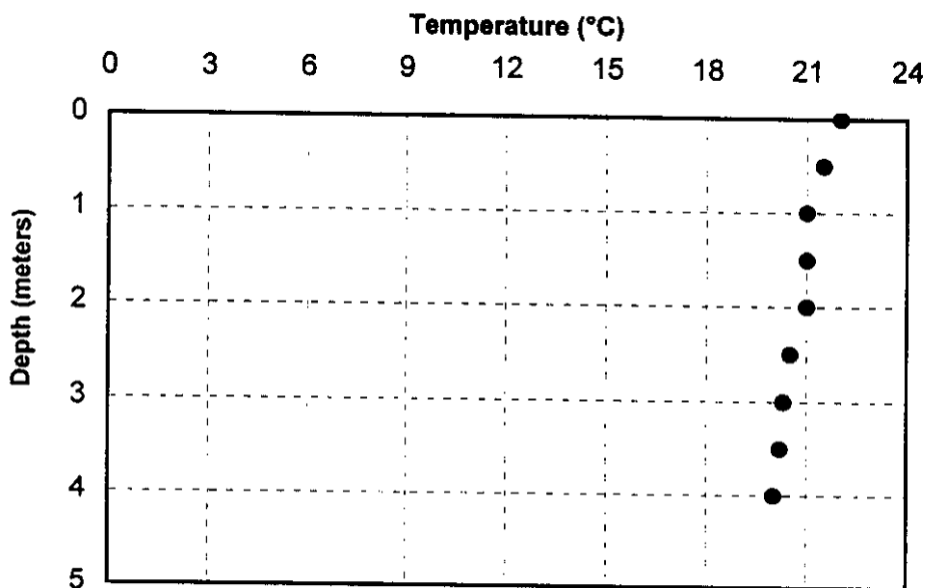
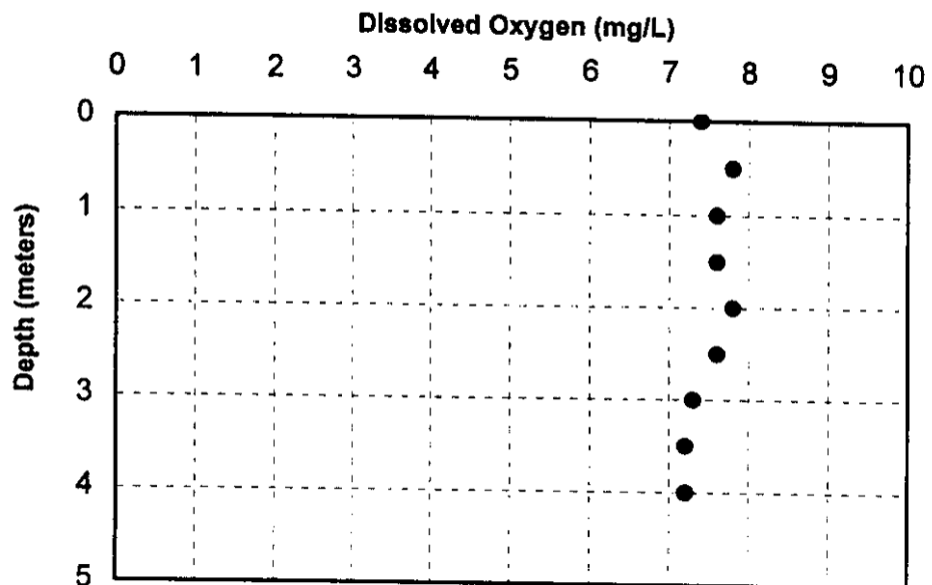
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	7.4	22.0	85
0.5	7.8	21.5	89
1.0	7.6	21.0	85
1.5	7.6	21.0	85
2.0	7.8	21.0	88
2.5	7.6	20.5	85
3.0	7.3	20.3	81
3.5	7.2	20.2	80
4.0	7.2	20.0	79
4.5			

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

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July 25, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

August 1, 2000

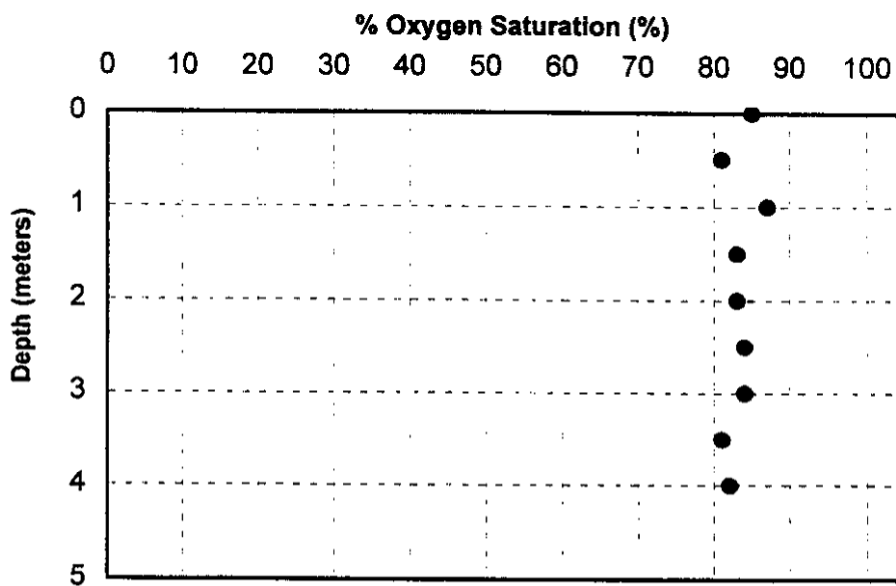
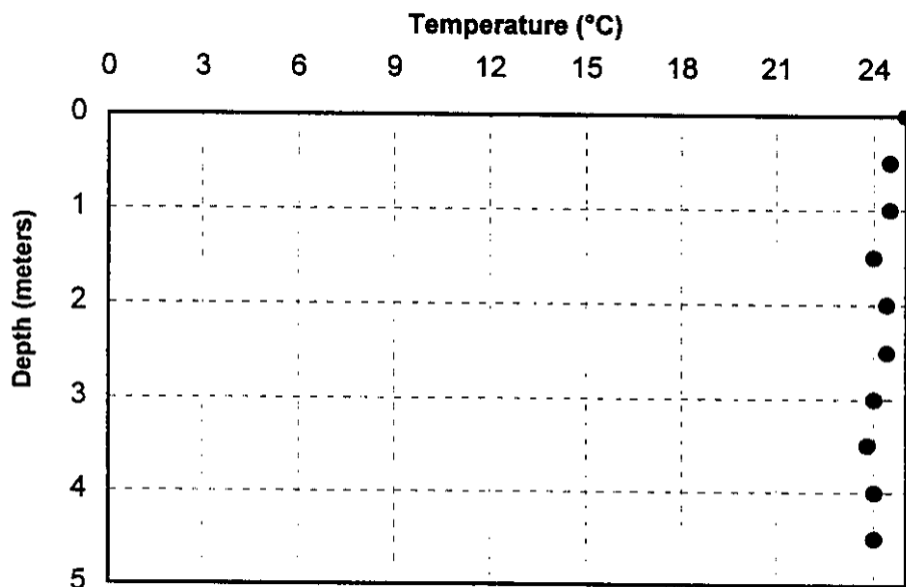
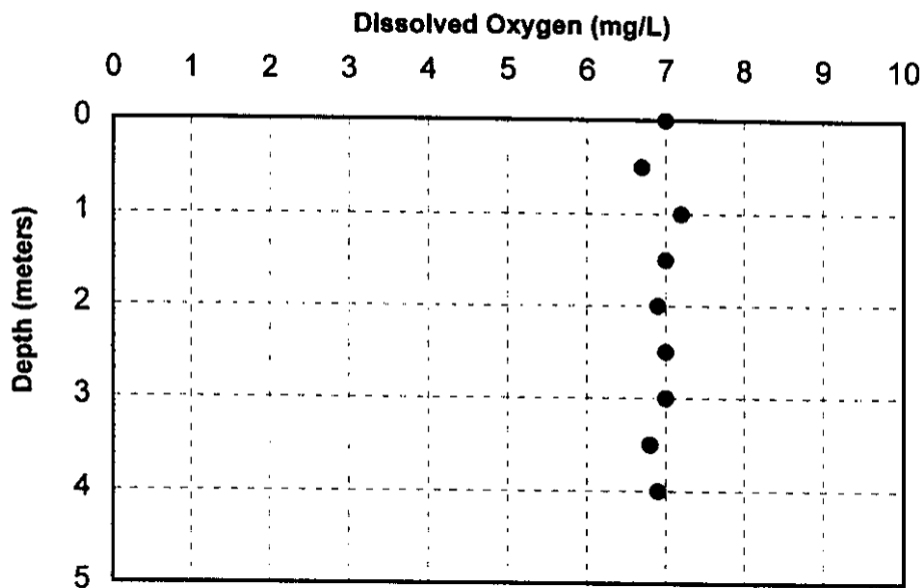
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	7.0	25.0	85
0.5	6.7	24.5	81
1.0	7.2	24.5	87
1.5	7.0	24.0	83
2.0	6.9	24.4	83
2.5	7.0	24.4	84
3.0	7.0	24.0	84
3.5	6.8	23.8	81
4.0	6.9	24.0	82
4.5		24.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

August 1, 2000



**Crystal Falls
Hydroelectric Project**

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Profiles**

August 10, 2000

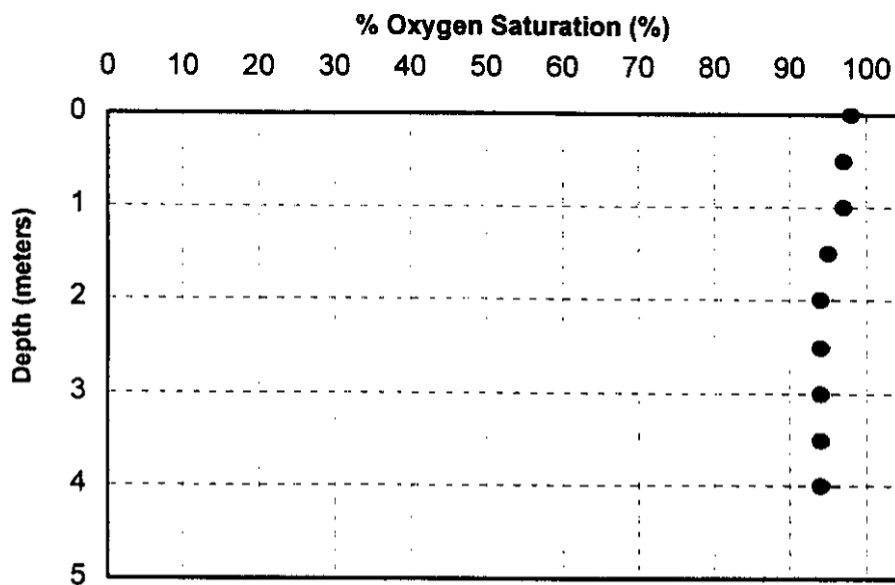
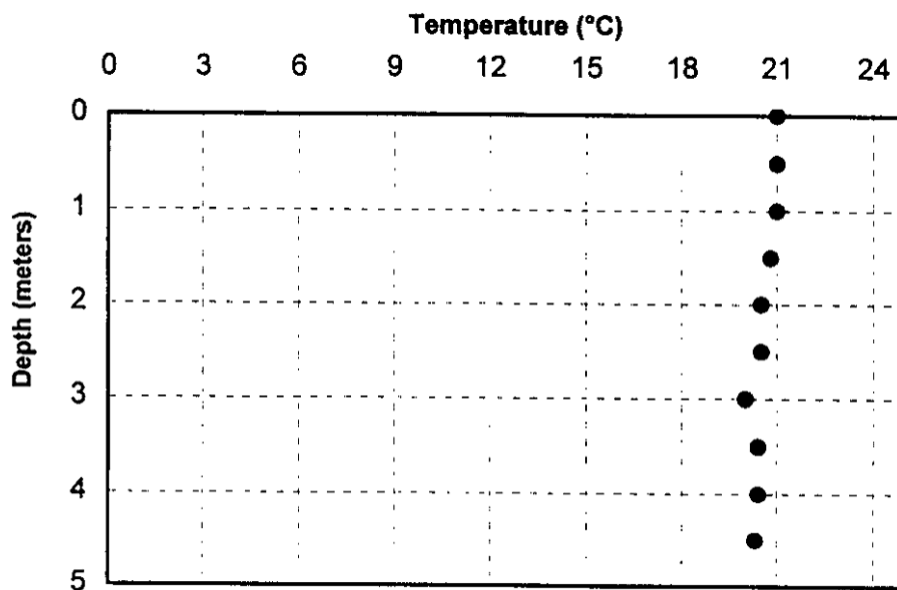
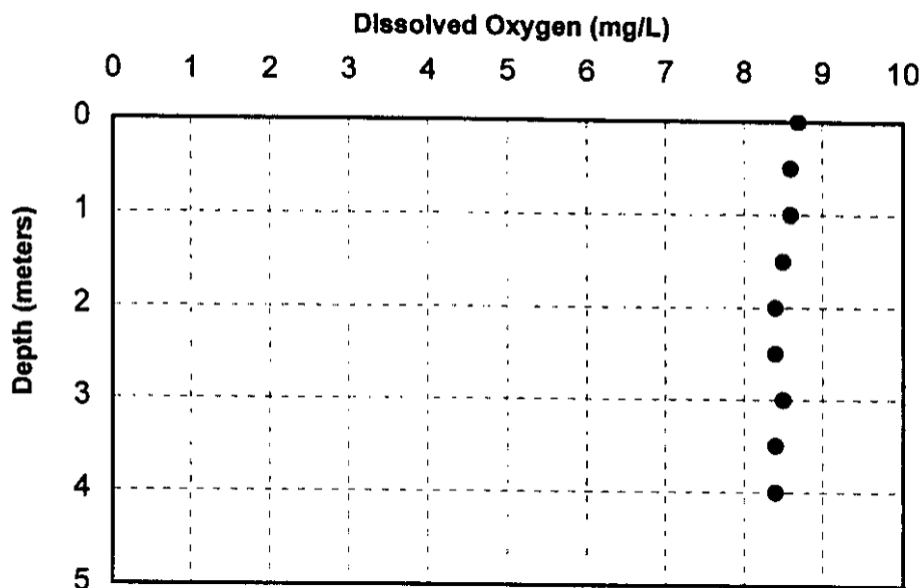
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.7	21.0	98
0.5	8.6	21.0	97
1.0	8.6	21.0	97
1.5	8.5	20.8	95
2.0	8.4	20.5	94
2.5	8.4	20.5	94
3.0	8.5	20.0	94
3.5	8.4	20.4	94
4.0	8.4	20.4	94
4.5		20.3	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

August 10, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

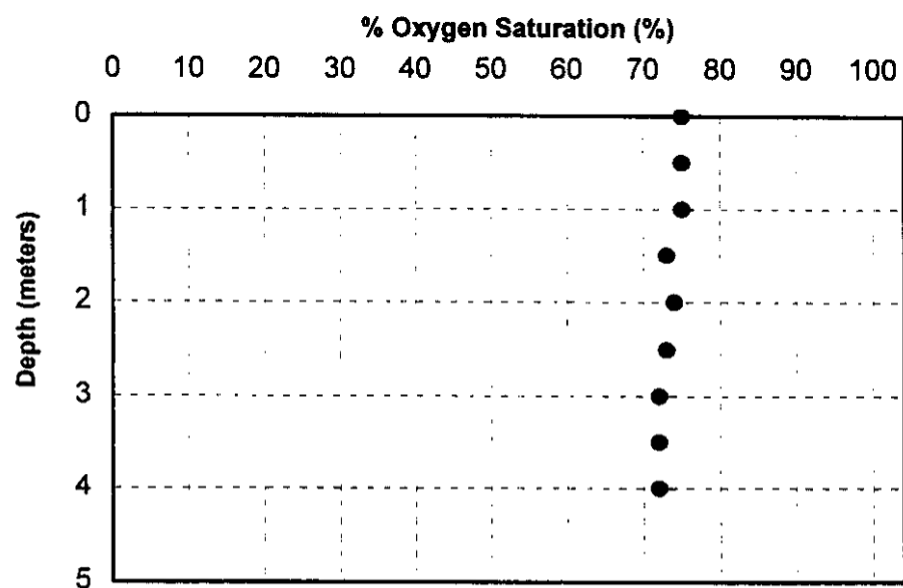
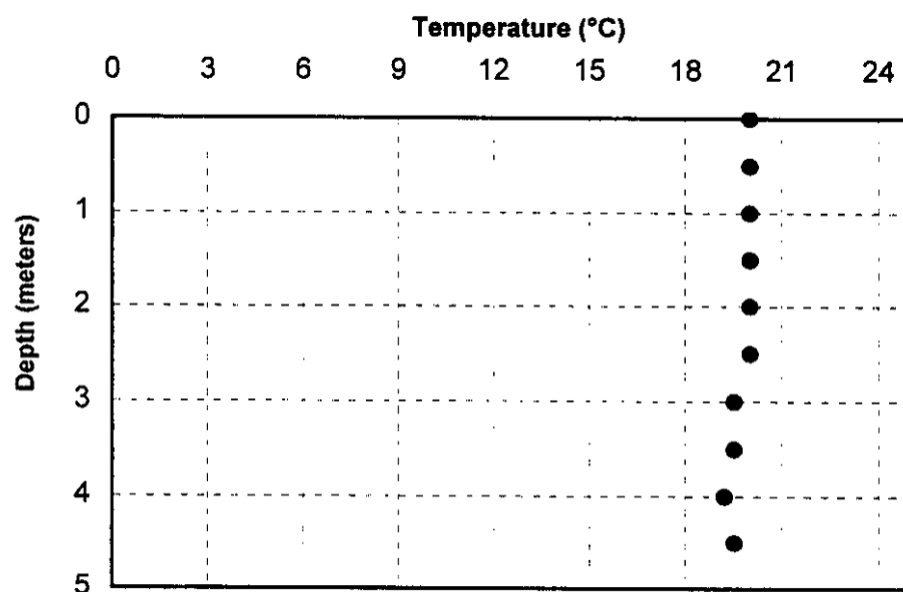
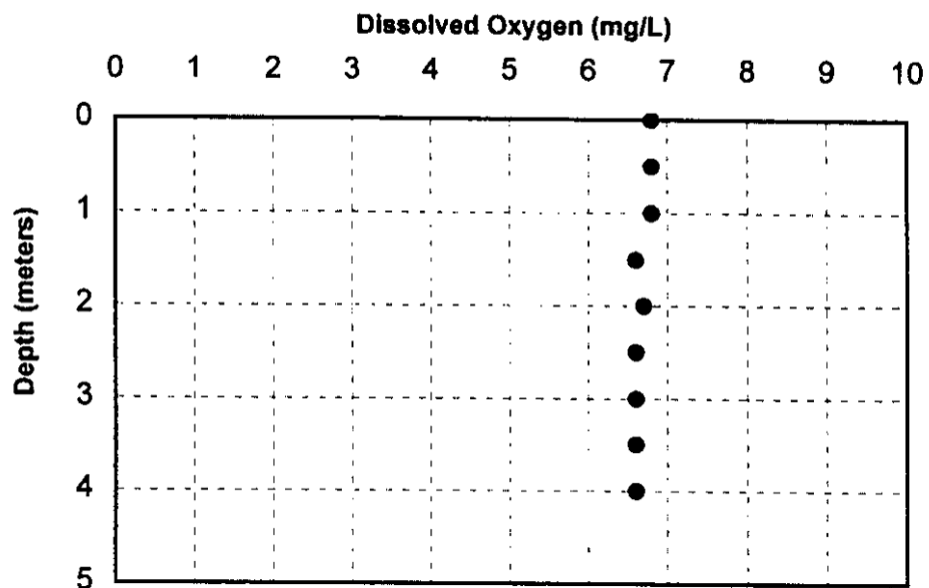
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
August 18, 2000	0.0	6.8	20.0	75
	0.5	6.8	20.0	75
	1.0	6.8	20.0	75
	1.5	6.6	20.0	73
	2.0	6.7	20.0	74
	2.5	6.6	20.0	73
	3.0	6.6	19.5	72
	3.5	6.6	19.5	72
	4.0	6.6	19.2	72
	4.5		19.5	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

August 18, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

August 24, 2000

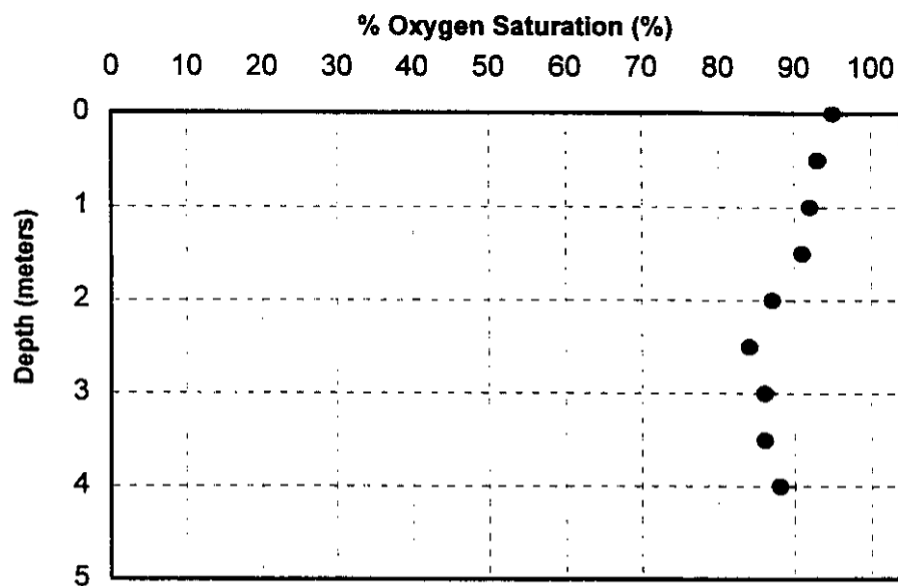
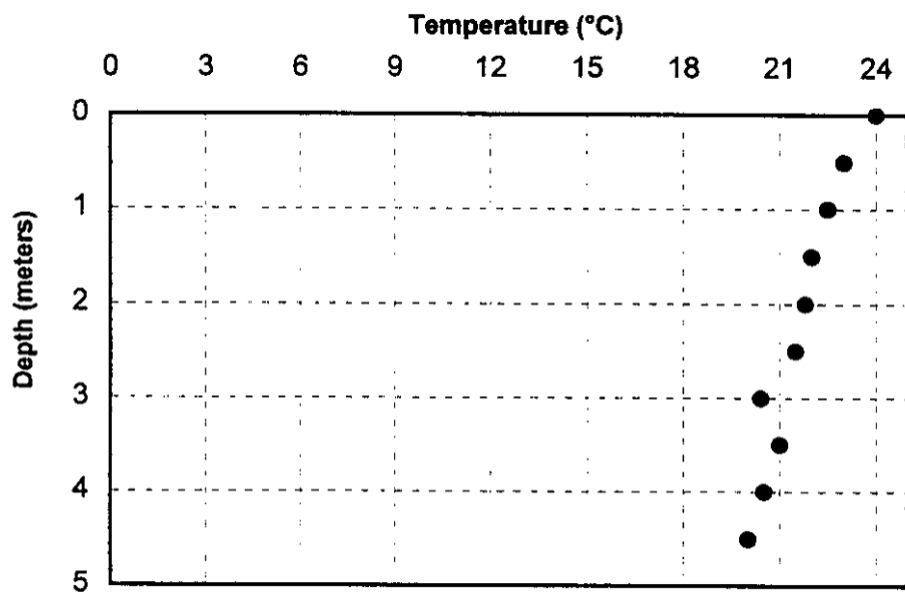
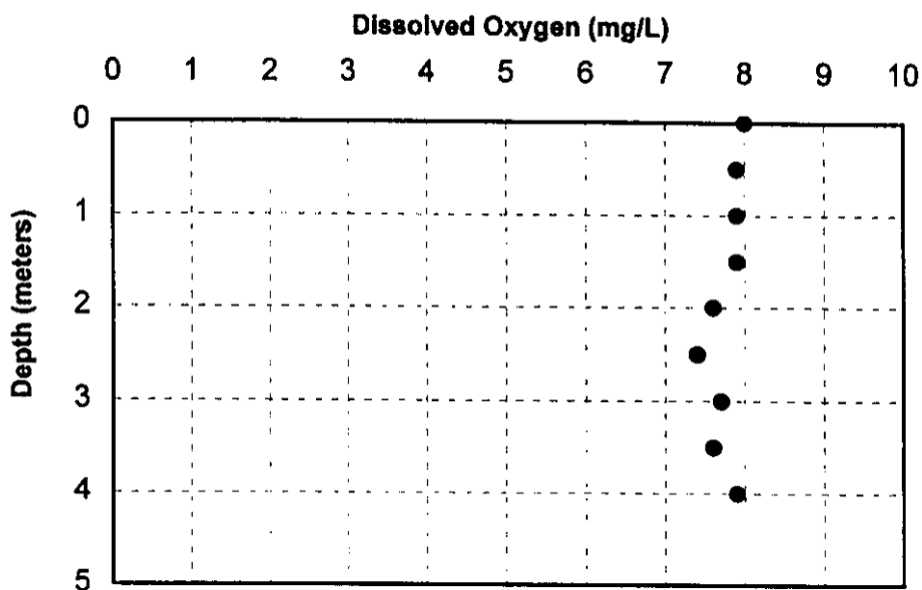
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.0	24.0	95
0.5	7.9	23.0	93
1.0	7.9	22.5	92
1.5	7.9	22.0	91
2.0	7.6	21.8	87
2.5	7.4	21.5	84
3.0	7.7	20.4	86
3.5	7.6	21.0	86
4.0	7.9	20.5	88
4.5		20.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

August 24, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

August 30, 2000

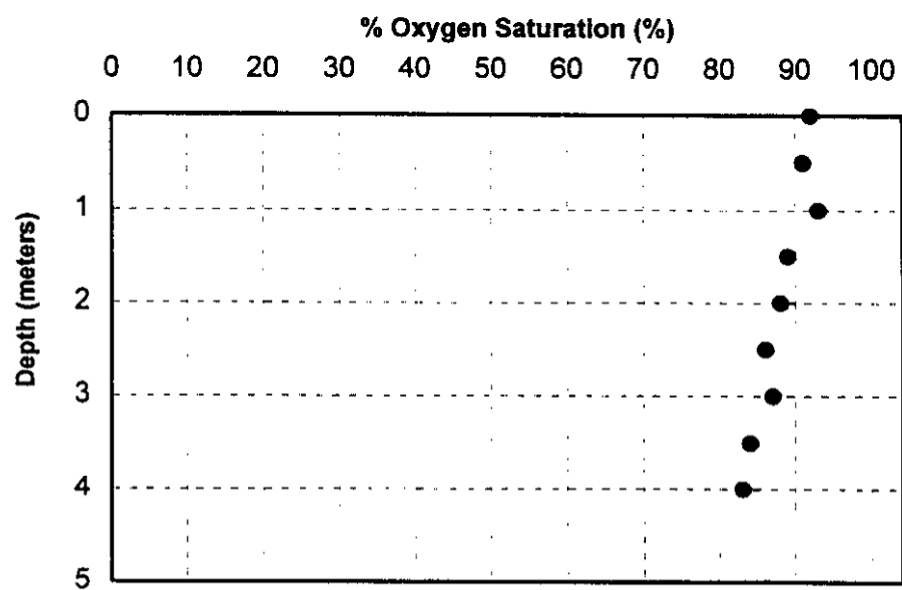
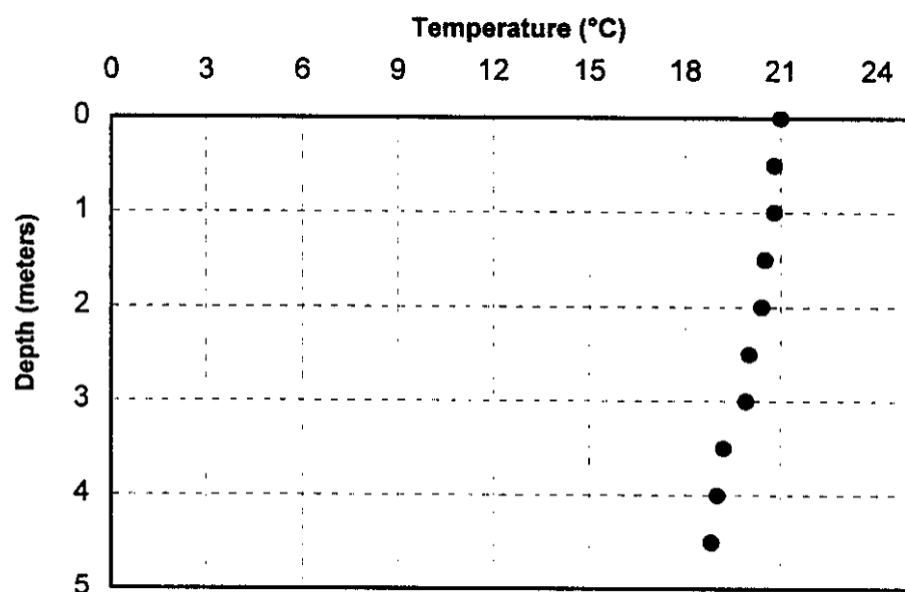
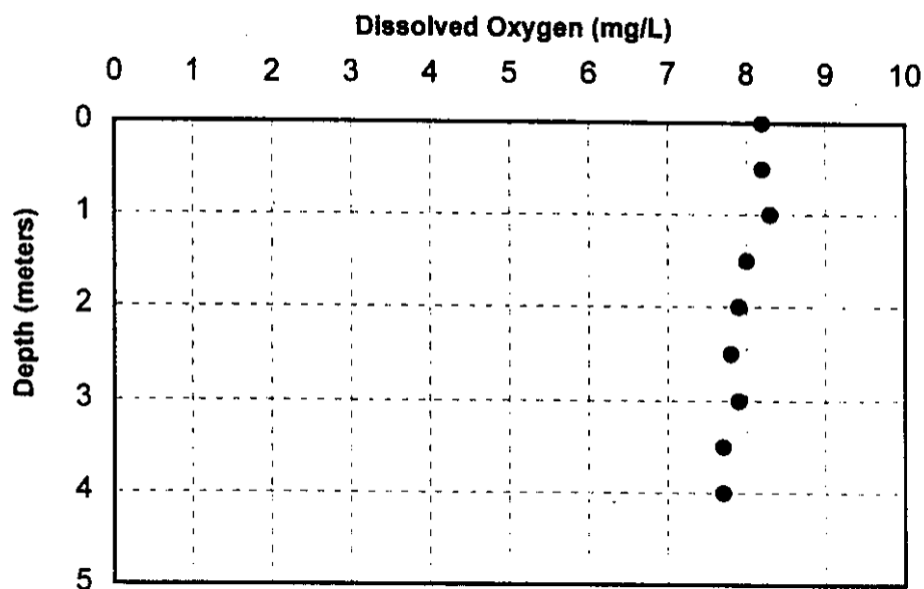
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.2	21.0	92
0.5	8.2	20.8	91
1.0	8.3	20.8	93
1.5	8.0	20.5	89
2.0	7.9	20.4	88
2.5	7.8	20.0	86
3.0	7.9	19.9	87
3.5	7.7	19.2	84
4.0	7.7	19.0	83
4.5		18.8	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

August 30, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

September 8, 2000

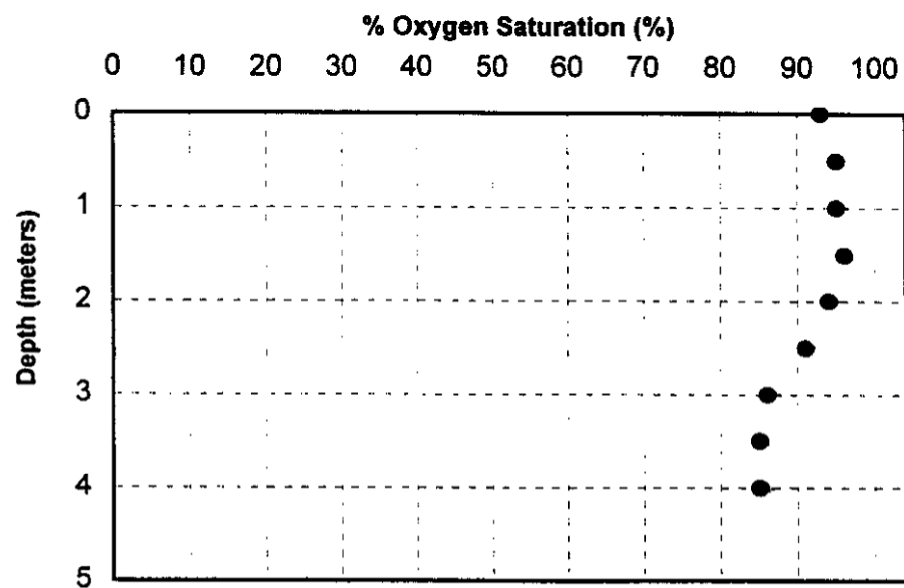
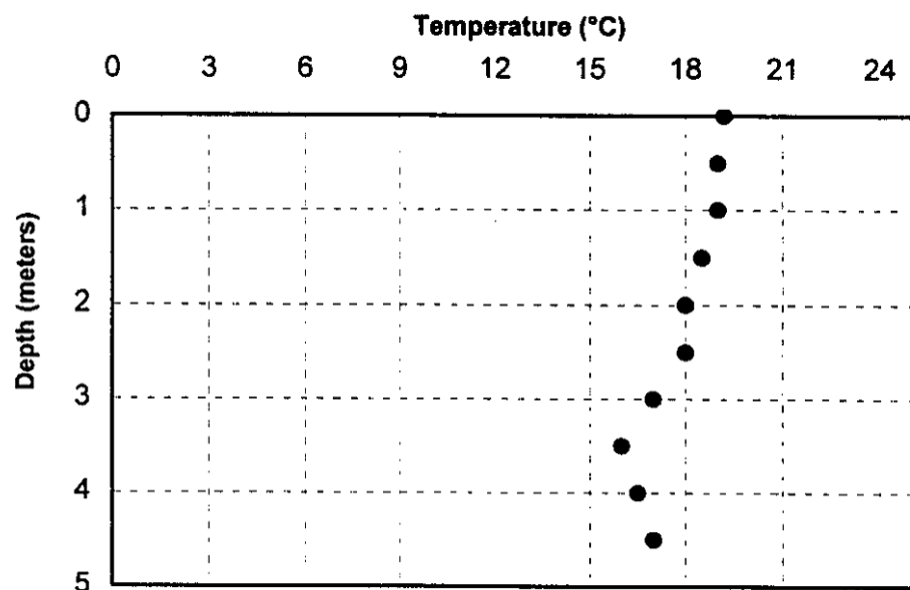
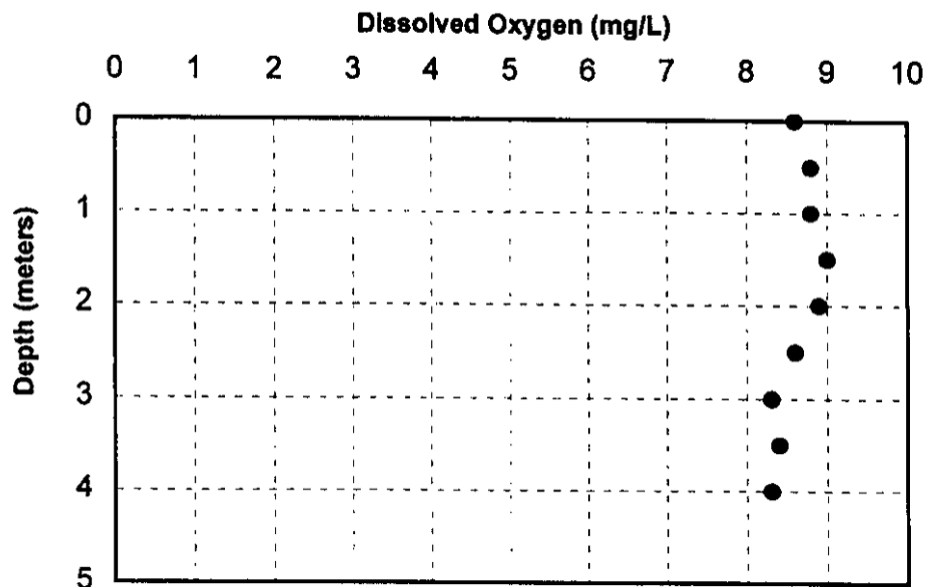
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.6	19.2	93
0.5	8.8	19.0	95
1.0	8.8	19.0	95
1.5	9.0	18.5	96
2.0	8.9	18.0	94
2.5	8.6	18.0	91
3.0	8.3	17.0	86
3.5	8.4	16.0	85
4.0	8.3	16.5	85
4.5		17.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

September 8, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

September 13, 2000

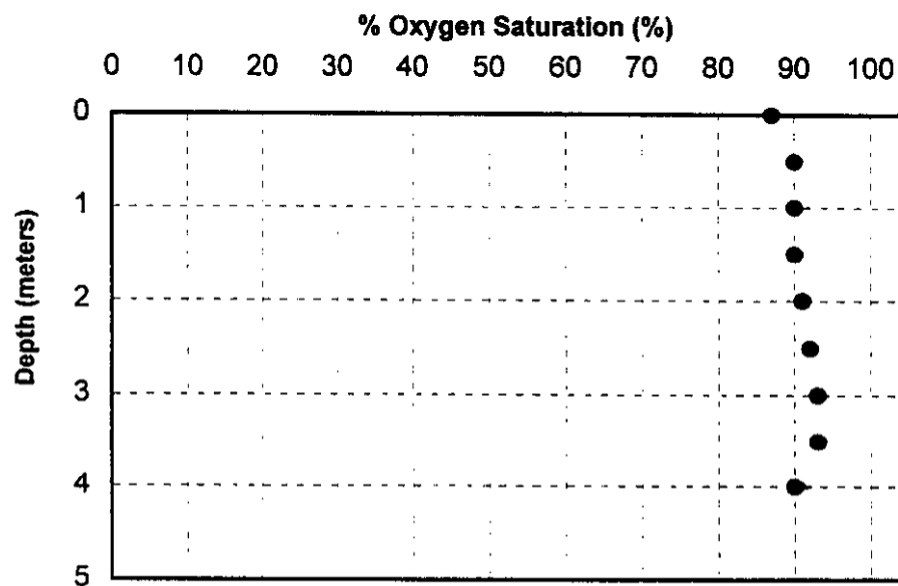
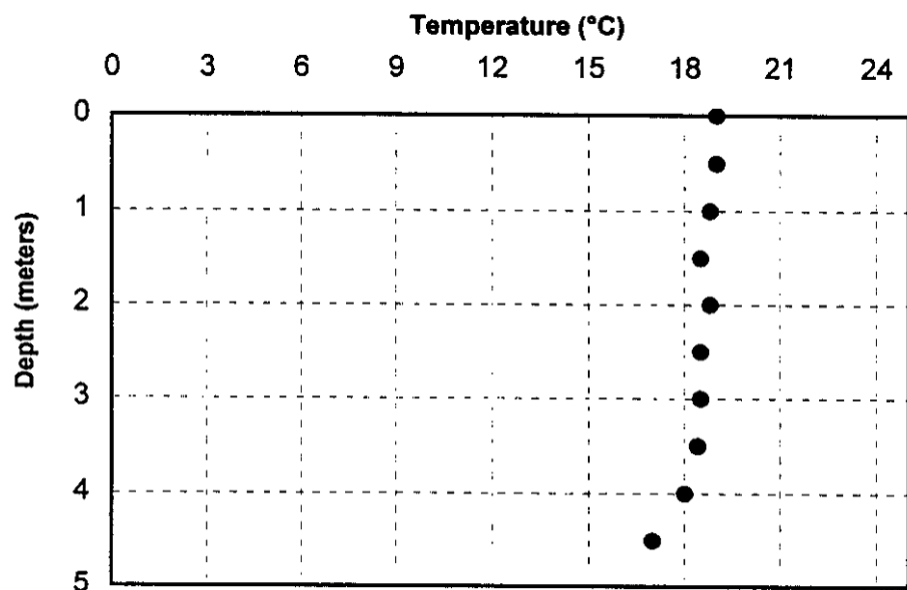
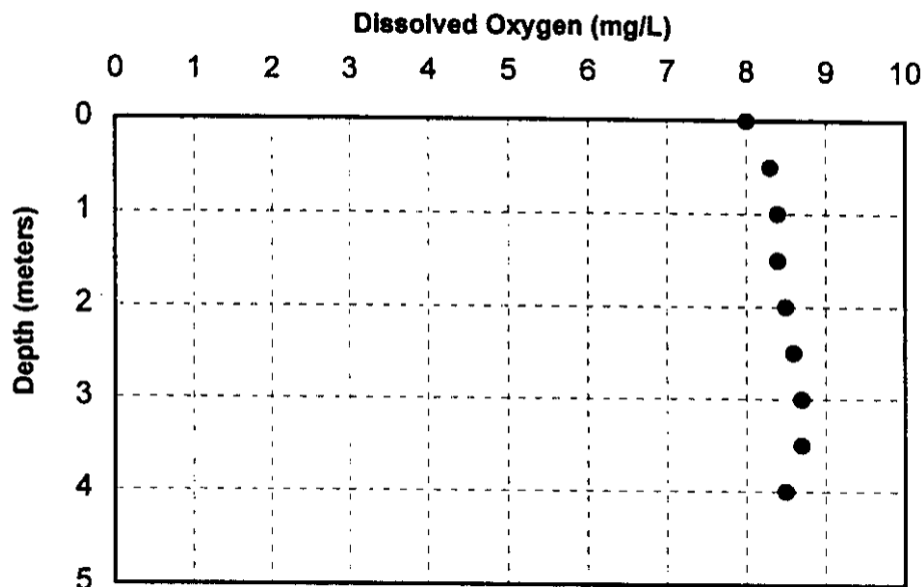
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.0	19.0	87
0.5	8.3	19.0	90
1.0	8.4	18.8	90
1.5	8.4	18.5	90
2.0	8.5	18.8	91
2.5	8.6	18.5	92
3.0	8.7	18.5	93
3.5	8.7	18.4	93
4.0	8.5	18.0	90
4.5		17.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

September 13, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

September 21, 2000

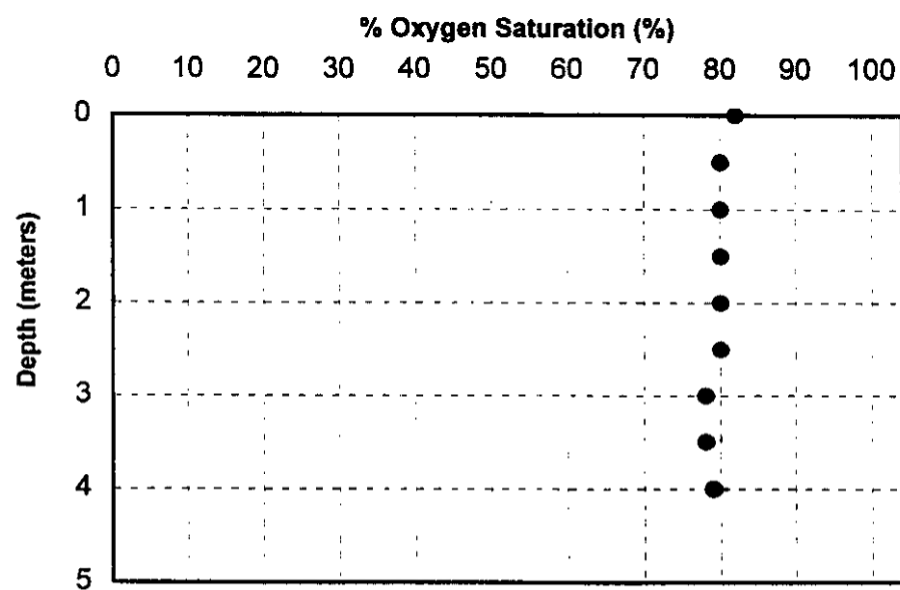
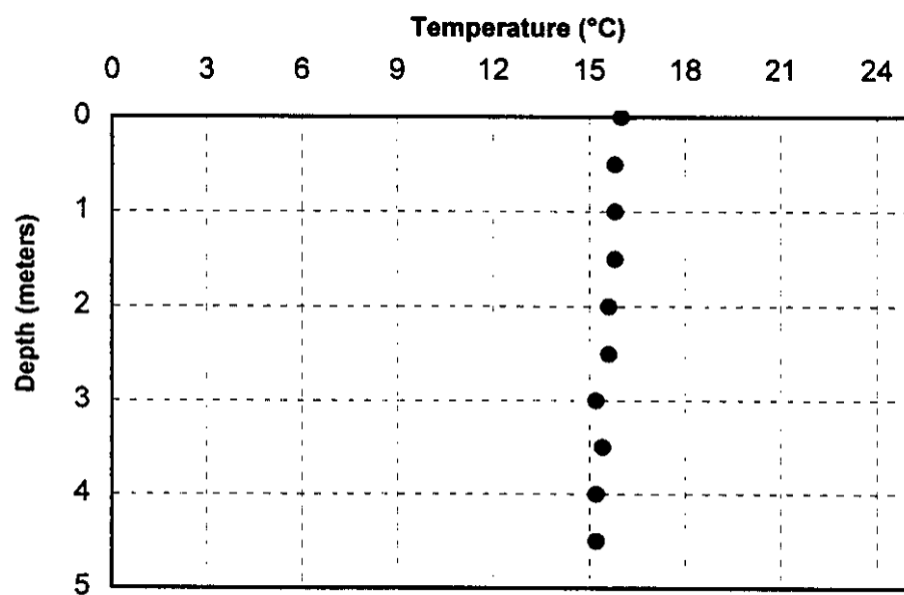
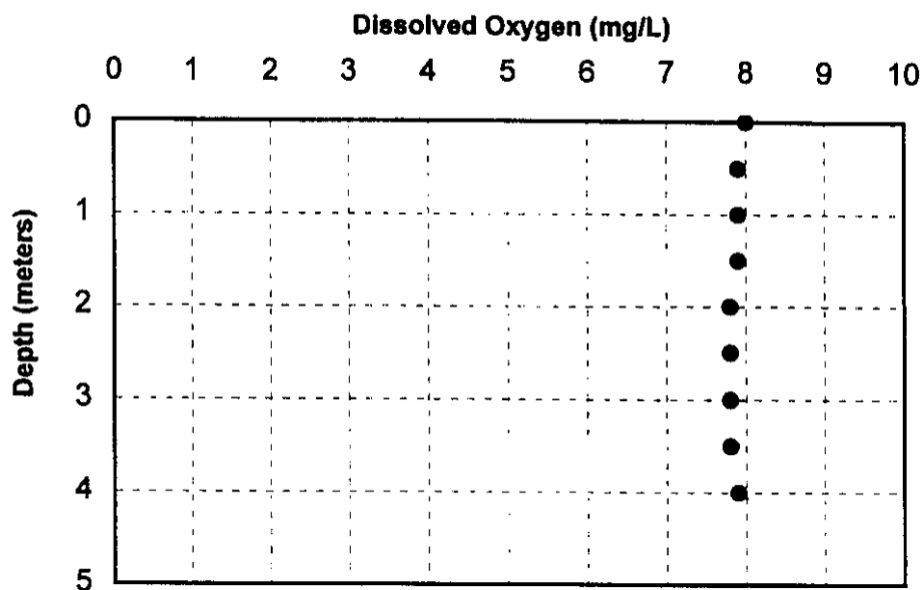
Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
0.0	8.0	16.0	82
0.5	7.9	15.8	80
1.0	7.9	15.8	80
1.5	7.9	15.8	80
2.0	7.8	15.6	80
2.5	7.8	15.6	80
3.0	7.8	15.2	78
3.5	7.8	15.4	78
4.0	7.9	15.2	79
4.5		15.2	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

September 21, 2000



**Crystal Falls
Hydroelectric Project**

**Limnological
Profiles**

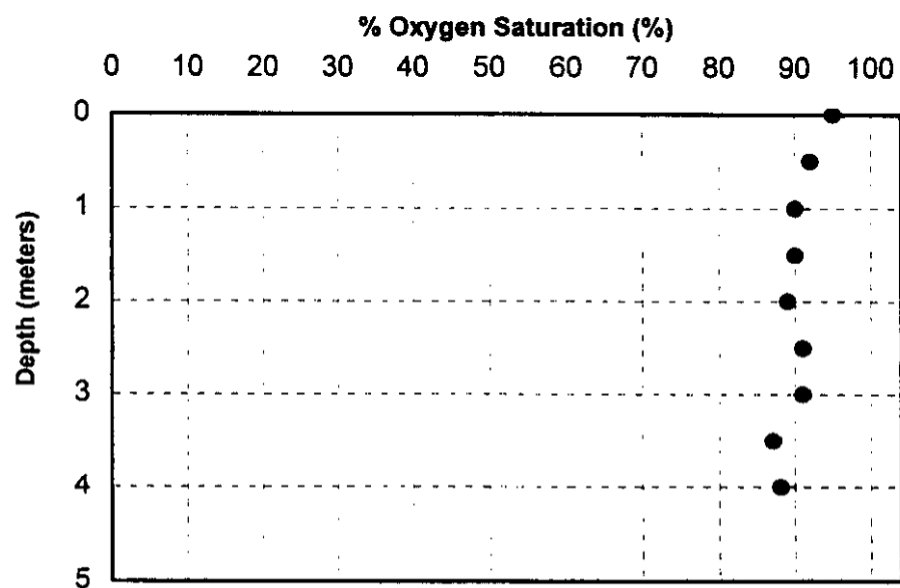
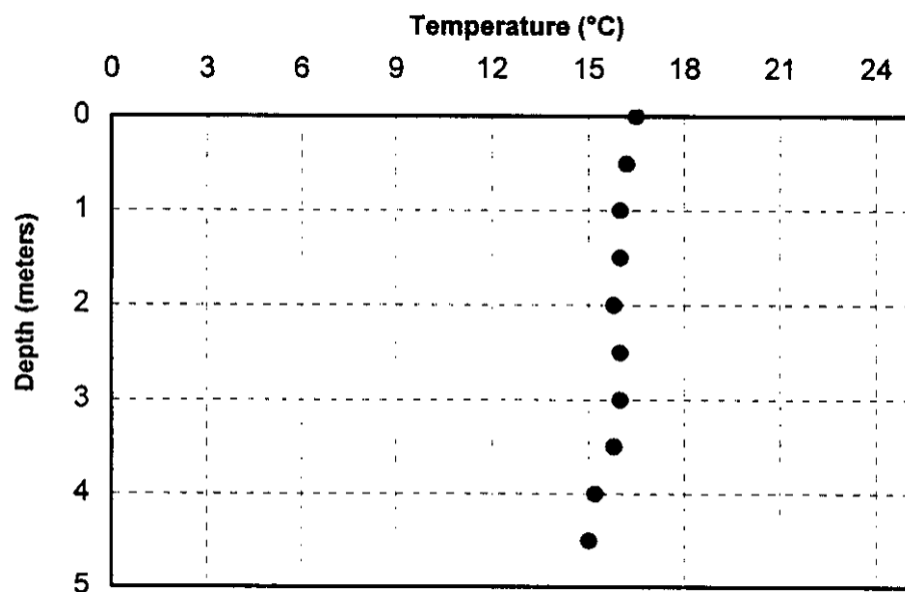
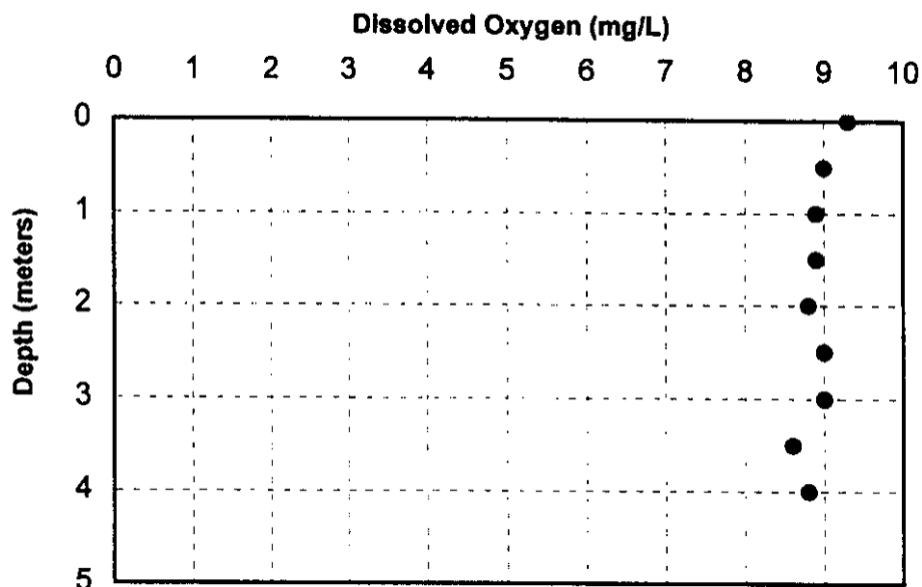
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
October 1, 2000	0.0	9.3	16.5	95
	0.5	9.0	16.2	92
	1.0	8.9	16.0	90
	1.5	8.9	16.0	90
	2.0	8.8	15.8	89
	2.5	9.0	16.0	91
	3.0	9.0	16.0	91
	3.5	8.6	15.8	87
	4.0	8.8	15.2	88
	4.5		15.0	

Blank cells indicate DO reading was not possible (at bottom).

**Crystal Falls
Hydroelectric
Project**

**Limnological
Profiles**

October 1, 2000



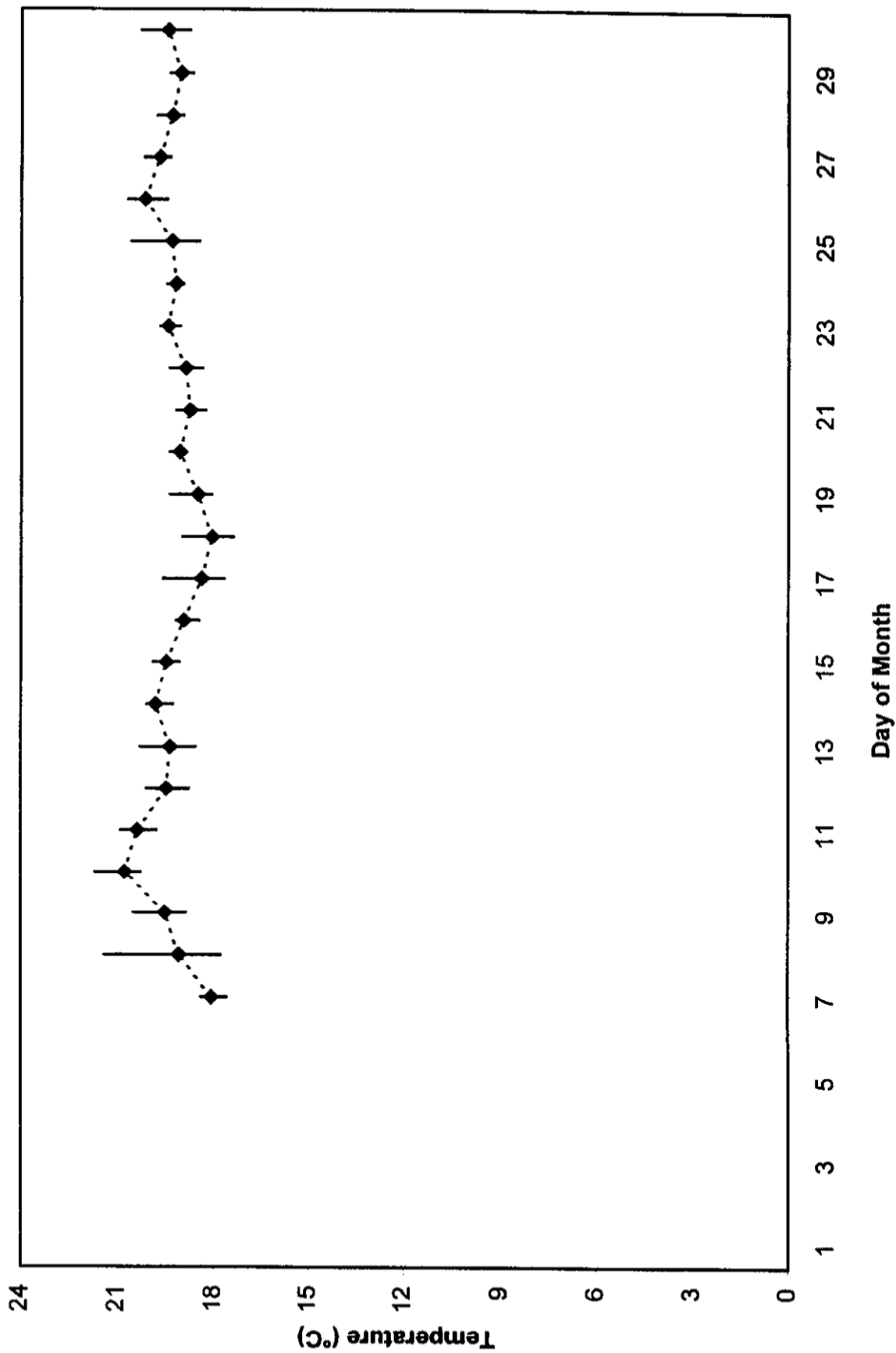
APPENDIX D

Upstream Temperature Monitoring

Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), June 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12:00a								18.0	19.8	20.6	20.9	20.1	19.4	20.1	19.8	19.2	18.4	18.0	18.5	19.3	19.0	18.7	19.4	19.1	19.1	18.1	20.6	20.2	19.8	19.0	19.0
1:00a								18.0	19.8	20.5	20.8	19.9	19.3	20.0	19.7	19.2	18.2	17.8	18.3	19.3	19.0	18.7	19.5	19.1	19.1	20.6	20.2	19.8	19.0	19.0	
2:00a								18.0	19.7	20.6	20.6	19.6	19.2	20.0	19.7	19.1	18.2	17.8	18.2	19.1	18.8	18.6	19.6	19.1	19.0	20.7	20.0	19.8	19.0	18.9	
3:00a								17.9	19.6	20.5	20.5	19.5	19.0	19.9	19.5	19.1	18.0	17.6	18.2	19.0	18.6	18.6	19.6	19.1	19.0	20.7	20.0	19.7	19.0	18.9	
4:00a								17.9	19.6	20.5	20.4	19.4	18.9	19.8	19.4	19.0	17.9	17.5	18.2	19.0	18.6	18.6	19.5	19.1	18.8	20.6	19.9	19.6	18.9	18.9	
5:00a								17.8	19.3	20.4	20.2	19.2	18.9	19.7	19.3	19.0	17.8	17.4	18.1	19.0	18.4	18.6	19.4	19.1	18.6	20.5	19.7	19.6	18.7	18.8	
6:00a								17.9	19.1	20.3	20.1	19.2	18.7	19.6	19.2	18.9	17.7	17.4	18.1	18.9	18.3	18.5	19.4	19.1	18.6	20.3	19.6	19.4	18.7	18.8	
7:00a								17.8	19.0	20.4	20.0	19.0	18.6	19.6	19.2	18.9	17.7	17.4	18.1	19.0	18.3	18.4	19.4	19.1	18.5	20.1	19.6	19.4	18.7	18.9	
8:00a								18.0	18.9	20.4	19.8	18.9	18.6	19.6	19.1	19.0	17.7	17.4	18.2	18.9	18.4	18.5	19.5	19.1	18.5	19.9	19.6	19.5	18.8	18.9	
9:00a								18.0	18.9	20.5	20.0	18.8	18.6	19.6	19.1	18.9	17.8	17.5	18.2	19.0	18.5	18.5	19.6	19.0	18.5	18.8	19.4	19.4	19.0	19.0	
10:00a								18.2	18.9	20.7	19.9	18.9	18.8	19.6	19.2	18.7	17.8	17.5	18.5	18.9	18.6	18.8	19.7	19.0	18.6	19.6	19.4	19.4	19.0	19.2	
11:00a								18.6	18.9	20.8	20.0	19.0	19.0	19.6	19.3	19.0	18.0	17.7	18.5	18.9	18.6	18.8	19.7	19.2	18.7	19.5	19.4	19.3	19.0	19.6	
12:00p								18.9	19.0	20.8	20.1	19.2	19.1	19.3	19.3	19.0	18.2	17.8	18.3	19.0	18.9	18.8	19.7	19.4	19.2	19.6	19.4	18.3	19.0	19.8	
1:00p							17.8	19.1	19.1	20.6	20.2	19.3	19.3	19.8	19.6	19.0	18.4	18.1	18.6	19.0	19.2	19.1	19.6	19.5	19.1	19.9	19.5	19.3	19.2	20.0	
2:00p								17.7	19.6	19.2	20.7	20.4	19.6	19.4	19.9	19.8	19.0	18.2	18.6	18.9	19.0	19.4	19.6	19.4	19.5	19.9	19.5	19.1	19.4	20.1	
3:00p								17.6	20.4	19.3	20.6	20.5	19.6	19.5	20.0	19.9	19.1	19.0	18.6	18.5	19.0	19.4	19.6	19.4	19.7	20.0	19.5	19.1	19.4	19.9	
4:00p								18.0	20.5	19.4	20.7	20.8	20.0	19.6	20.0	19.9	19.1	19.2	19.0	18.5	19.3	19.0	19.3	19.6	19.3	19.8	20.0	19.6	19.1	19.4	20.2
5:00p								18.3	20.7	19.6	20.8	20.9	20.1	19.8	20.1	19.9	19.1	19.6	19.0	18.6	19.4	19.0	19.3	19.4	19.5	20.0	20.1	19.7	18.1	19.3	20.3
6:00p								18.4	21.0	20.0	21.2	20.8	20.0	20.1	20.1	19.8	19.1	19.4	19.0	18.6	19.3	19.0	19.3	19.4	19.4	20.1	20.3	19.8	19.1	19.4	20.3
7:00p								18.3	21.4	20.2	21.7	20.8	19.9	20.2	20.0	19.6	19.0	19.2	18.6	18.6	19.3	19.0	19.2	19.3	19.3	20.2	20.4	19.8	19.1	19.3	19.9
8:00p								18.3	21.3	20.3	21.6	20.8	19.9	20.3	20.0	19.6	18.9	19.1	18.8	19.1	19.2	19.0	19.2	19.2	19.3	20.3	20.3	19.8	19.0	19.2	19.8
9:00p								18.3	19.8	20.4	21.5	20.5	19.8	20.3	20.0	19.4	18.7	18.6	18.7	19.3	19.2	19.0	19.2	19.2	19.2	20.3	20.3	19.9	18.0	19.1	19.7
10:00p								18.3	19.5	20.5	21.3	20.4	19.6	20.3	19.9	19.3	18.6	18.5	18.6	19.4	19.2	18.8	19.3	19.1	19.2	20.5	20.3	19.8	19.0	19.0	19.6
11:00p								18.0	20.2	20.5	21.2	20.2	19.4	20.2	19.8	19.3	18.5	18.3	18.5	19.4	19.0	18.7	19.3	19.1	19.2	20.6	20.3	19.9	19.0	19.0	19.6
Max.								18.4	21.4	20.5	21.7	20.9	20.1	20.3	20.1	19.9	19.2	19.6	19.0	19.4	19.4	19.2	19.4	19.7	19.5	20.6	20.7	20.2	19.8	19.4	20.3
Min.								17.6	17.8	18.9	20.3	19.8	18.8	18.6	19.3	19.1	18.5	17.7	17.4	18.1	18.9	18.3	18.4	19.1	19.0	18.5	19.5	19.4	19.0	18.7	18.8
Avg.								18.1	19.1	19.5	20.8	20.4	19.5	19.4	19.8	19.5	19.0	18.4	18.1	18.5	19.1	18.8	18.9	19.5	19.2	19.3	20.2	19.7	19.3	19.1	19.5

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
June 2000

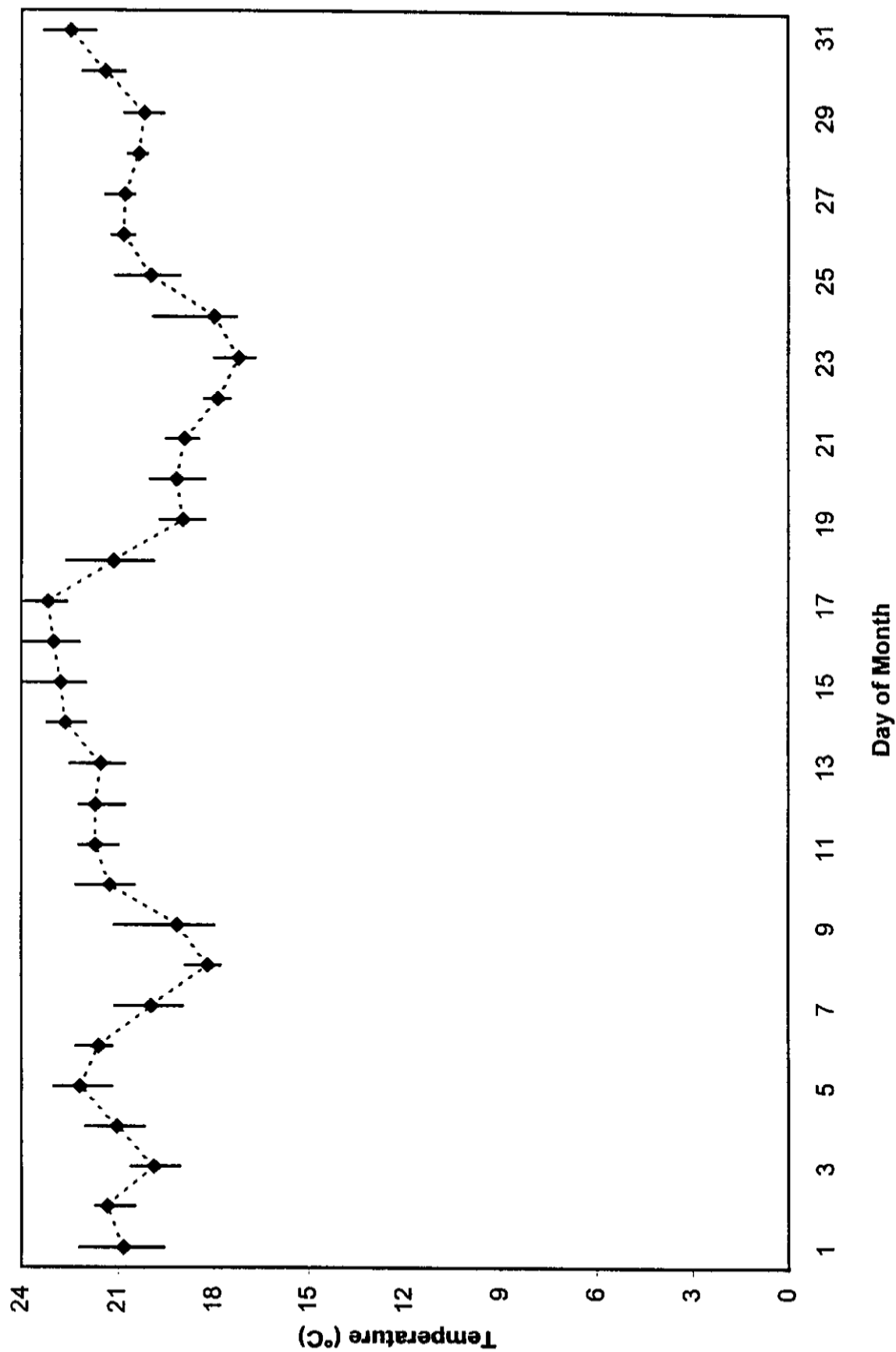


Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), July 2000

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	19.7	21.4	20.2	20.2	21.3	22.0	21.1	18.9	18.0	21.1	22.2	22.2	20.8	22.2	22.3	22.7	23.2	22.6	19.7	19.1	19.5	18.3	17.3	18.0	19.9	21.0	20.9	20.5	20.2	20.9	21.7
1:00a	19.6	21.3	20.1	20.2	21.2	21.8	20.8	18.8	18.0	21.1	22.1	22.2	20.8	22.1	22.3	22.6	23.1	22.5	19.6	18.9	19.3	18.1	17.1	17.8	19.9	20.9	20.8	20.5	20.1	21.0	21.7
2:00a	19.7	21.3	19.9	20.2	21.2	21.6	20.7	18.8	18.0	21.0	22.0	22.2	20.8	22.0	22.3	22.5	23.0	22.3	19.4	18.6	19.2	18.0	17.1	17.7	19.6	20.8	20.8	20.5	20.0	20.9	21.7
3:00a	19.6	21.2	19.8	20.2	21.3	21.4	20.5	18.6	18.1	21.0	21.8	22.2	20.8	22.2	22.2	22.3	22.9	22.1	19.3	18.5	19.1	18.0	17.0	17.5	19.4	20.6	20.8	20.5	19.9	20.8	21.7
4:00a	19.7	21.2	19.6	20.2	21.4	21.4	20.4	18.6	18.1	20.8	21.7	22.1	20.8	22.2	22.0	22.3	22.8	21.9	19.1	18.3	19.1	17.8	16.9	17.4	19.3	20.8	20.7	20.6	19.8	20.9	21.7
5:00a	19.8	21.2	19.4	20.3	21.4	21.2	20.2	18.5	18.0	20.8	21.4	22.0	20.8	22.2	22.0	22.2	22.7	21.7	18.8	18.4	19.1	17.7	16.8	17.3	19.1	20.6	20.7	20.5	19.7	20.8	21.8
6:00a	19.8	21.2	19.3	20.4	21.6	21.2	20.2	18.5	18.0	20.5	21.3	21.9	20.8	22.3	22.0	22.2	22.6	21.6	18.6	18.4	19.1	17.6	16.8	17.3	19.1	20.6	20.6	20.7	19.6	20.8	21.8
7:00a	20.0	21.4	19.1	20.5	21.7	21.2	20.1	18.4	18.1	20.6	21.2	22.0	20.8	22.4	22.0	22.2	22.6	21.4	18.5	18.4	19.0	17.6	16.7	17.4	19.1	20.6	20.6	20.7	19.6	20.8	21.9
8:00a	20.2	21.4	19.2	20.7	21.8	21.2	20.1	18.3	18.1	20.5	21.1	21.9	20.9	22.4	22.3	22.3	22.6	21.3	18.6	18.5	19.0	17.6	16.8	17.5	19.2	20.5	20.5	20.6	19.6	20.8	22.0
9:00a	20.4	21.6	19.1	20.9	22.0	21.4	20.1	18.2	18.3	20.5	21.2	22.0	21.0	22.6	22.3	22.6	22.8	21.2	18.6	18.5	19.0	17.7	16.8	17.4	19.4	20.5	20.5	20.5	19.6	21.0	22.3
10:00a	20.6	21.6	19.3	21.0	22.3	21.5	20.1	18.1	18.4	20.6	21.0	22.0	21.4	22.7	22.6	22.8	22.9	21.1	18.6	18.6	19.0	17.9	16.8	17.8	19.4	20.5	20.7	20.5	19.6	21.2	22.3
11:00a	20.8	21.7	19.5	21.3	22.5	21.5	20.2	18.0	18.6	20.7	21.2	21.9	21.5	22.8	22.7	23.2	23.2	21.1	18.5	18.0	19.0	18.0	17.0	17.9	19.5	20.6	20.8	20.3	19.7	21.4	22.9
12:00p	21.2	21.7	19.9	21.4	22.8	21.5	20.2	17.9	19.0	20.8	21.4	21.8	21.7	22.9	22.9	22.9	23.3	21.0	18.4	19.3	18.9	17.9	17.1	18.0	19.6	20.7	21.0	20.3	19.8	21.8	23.2
1:00p	21.5	21.7	19.8	21.6	22.9	21.7	20.1	17.8	19.2	20.9	21.4	21.8	22.0	23.1	23.2	23.1	23.5	20.8	18.3	19.5	18.9	17.9	17.1	18.2	19.9	20.8	21.4	20.2	20.0	22.0	23.3
2:00p	21.9	21.7	20.6	21.4	22.9	21.9	20.0	17.8	19.4	21.2	21.9	21.7	22.1	23.1	23.5	23.2	23.8	20.8	18.8	19.8	19.0	18.0	17.3	18.3	20.0	20.8	21.2	20.2	20.5	21.7	22.7
3:00p	22.2	21.7	20.2	21.5	22.9	22.0	19.9	17.9	19.6	21.4	22.0	21.7	22.1	23.2	23.6	23.5	23.9	20.8	19.1	19.9	18.9	17.9	17.2	18.0	20.2	21.0	20.8	20.2	20.6	22.1	22.9
4:00p	22.2	21.5	20.0	21.4	23.0	22.0	19.8	17.9	20.0	21.7	21.7	21.6	22.2	23.2	23.5	23.4	23.9	20.8	19.1	20.0	18.9	18.1	17.1	18.0	20.3	21.1	20.9	20.1	20.8	21.5	22.8
5:00p	21.7	21.5	20.4	21.8	22.9	22.3	19.6	18.0	20.2	21.8	22.0	21.4	22.5	23.2	24.0	23.8	23.9	20.7	19.1	20.0	18.9	18.0	17.4	18.0	20.5	21.2	20.9	20.1	20.8	22.0	22.8
6:00p	21.9	21.4	20.4	22.0	22.9	22.2	19.6	18.0	20.5	22.0	22.0	21.3	22.4	23.1	23.8	24.0	23.7	20.6	19.5	20.0	18.8	18.0	17.7	18.0	20.8	21.1	20.8	20.2	20.7	22.1	22.9
7:00p	21.8	21.3	20.5	21.8	22.9	21.8	19.4	17.9	20.6	22.0	22.1	21.2	22.3	22.9	23.5	24.0	23.5	20.5	19.2	19.9	18.7	17.9	17.8	18.0	21.0	21.1	20.9	20.1	20.8	22.0	22.9
8:00p	21.6	21.1	20.4	21.8	22.6	21.8	19.3	17.9	20.8	22.3	22.0	21.1	22.2	22.8	23.2	23.7	23.3	20.3	19.5	19.9	18.6	18.1	18.0	18.5	21.1	21.1	20.8	20.2	20.7	21.9	23.2
9:00p	21.5	20.9	20.3	21.4	22.5	21.5	19.1	17.9	20.9	22.3	22.0	21.0	22.1	22.7	23.0	23.8	23.1	20.2	19.3	19.7	18.8	17.8	17.7	18.6	21.1	21.1	20.7	20.2	20.8	21.8	23.2
10:00p	21.5	20.7	20.2	21.4	22.3	21.4	19.0	18.0	20.9	22.3	22.1	21.0	22.1	22.6	22.9	23.5	23.0	20.0	19.2	19.7	18.5	17.7	17.8	19.4	21.1	21.0	20.7	20.2	20.8	21.7	23.1
11:00p	21.4	20.5	20.2	21.3	22.2	21.2	19.0	18.0	21.1	22.3	22.1	20.8	22.2	22.5	22.8	23.3	22.8	19.9	19.0	19.6	18.5	17.5	18.0	19.9	21.1	21.0	20.6	20.2	20.8	21.7	22.9
Max.	22.2	21.7	20.6	22.0	23.0	22.3	21.1	18.9	21.1	22.3	22.2	22.2	22.5	23.2	24.0	24.0	23.9	22.6	19.7	20.0	19.5	18.3	18.0	19.9	21.1	21.2	21.4	20.7	20.8	22.1	23.3
Min.	19.6	20.5	19.1	20.2	21.2	21.2	19.0	17.8	18.0	20.5	21.0	20.8	20.8	22.0	22.0	22.2	22.6	18.9	18.3	18.3	18.5	17.5	16.7	17.3	19.1	20.5	20.5	20.1	19.6	20.8	21.7
Avg.	20.8	21.3	19.9	21.0	22.2	21.6	20.0	18.2	19.2	21.3	21.7	21.7	21.5	22.6	22.8	23.0	23.2	21.1	19.0	19.2	18.9	17.9	17.2	18.0	20.0	20.8	20.8	20.4	20.2	21.4	22.5

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
July 2000

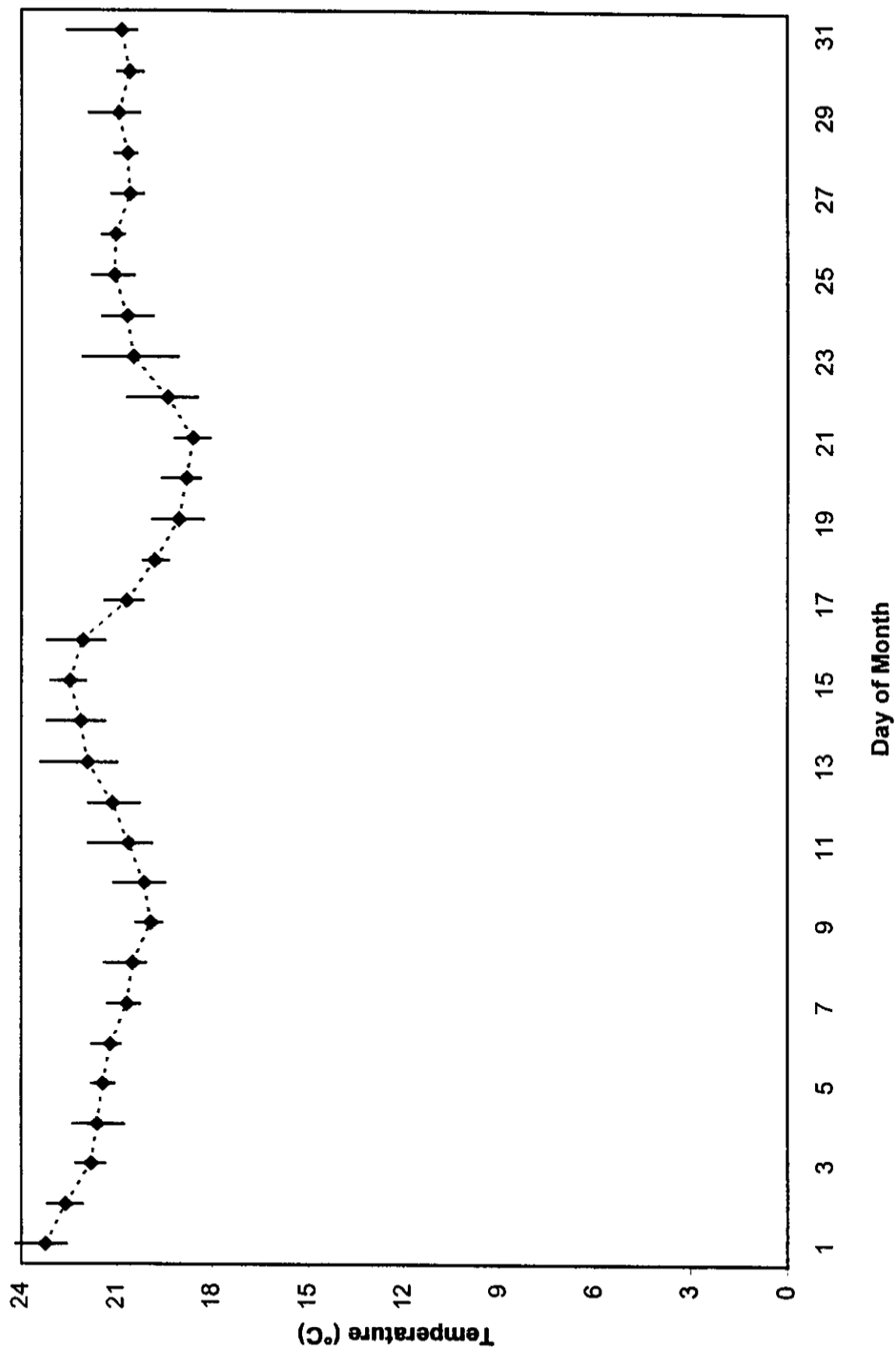


Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), August 2000

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	22.8	23.2	22.3	21.4	21.7	21.4	20.8	20.7	20.0	19.8	20.2	20.8	21.6	21.8	22.6	22.1	21.4	20.2	19.2	19.6	18.8	19.0	20.0	20.7	21.8	21.0	20.9	20.8	20.7	20.9	20.5
1:00a	22.7	23.0	22.2	21.3	21.5	21.4	20.6	20.7	20.0	19.8	20.2	20.8	21.5	21.7	22.6	22.0	21.3	20.1	19.0	19.3	18.6	19.1	19.8	20.5	21.7	20.9	20.8	20.8	20.5	20.7	20.5
2:00a	22.7	22.9	22.1	21.2	21.3	21.2	20.5	20.5	19.9	19.7	20.1	20.6	21.4	21.6	22.4	21.9	21.2	20.0	18.8	19.1	18.6	18.9	19.6	20.4	21.4	20.9	20.6	20.8	20.5	20.7	20.5
3:00a	22.6	22.7	22.0	21.1	21.2	21.2	20.4	20.5	19.9	19.6	20.0	20.5	21.3	21.5	22.3	21.8	21.1	19.9	18.6	18.9	18.4	18.8	19.3	20.3	21.2	20.8	20.5	20.7	20.5	20.5	20.5
4:00a	22.6	22.5	21.8	21.1	21.1	21.1	20.4	20.4	19.8	19.6	20.0	20.4	21.2	21.5	22.3	21.7	21.1	19.7	18.5	18.6	18.3	18.7	19.3	20.2	21.0	20.8	20.3	20.5	20.5	20.5	20.5
5:00a	22.6	22.4	21.6	21.0	21.1	21.1	20.4	20.4	19.7	19.5	19.9	20.3	21.1	21.5	22.1	21.5	21.0	19.6	18.4	18.5	18.2	18.6	19.1	20.1	20.8	20.8	20.2	20.5	20.5	20.2	20.5
6:00a	22.6	22.3	21.5	20.8	21.1	21.0	20.3	20.3	19.7	19.5	19.9	20.3	21.1	21.4	22.0	21.4	20.8	19.5	18.3	18.4	18.1	18.5	19.1	20.0	20.6	20.8	20.2	20.5	20.4	20.2	20.4
7:00a	22.7	22.2	21.4	20.8	21.1	21.0	20.3	20.3	19.6	19.5	20.0	20.4	21.1	21.4	22.0	21.4	20.8	19.4	18.3	18.4	18.1	18.6	19.1	19.8	20.5	20.8	20.2	20.4	20.4	20.2	20.5
8:00a	23.0	22.1	21.5	21.0	21.3	21.0	20.3	20.2	19.6	19.6	20.2	20.5	21.0	21.6	22.0	21.4	20.8	19.4	18.3	18.5	18.2	18.6	19.3	20.0	20.5	20.8	20.2	20.4	20.3	20.2	20.5
9:00a	23.1	22.1	21.7	21.0	21.2	21.0	20.3	20.2	19.6	19.7	20.4	20.7	21.1	21.7	22.0	21.5	20.8	19.6	18.5	18.5	18.2	19.0	19.5	20.2	20.5	20.8	20.5	20.4	20.4	20.4	20.5
10:00a	23.2	22.2	21.7	21.2	21.4	21.0	20.4	20.2	19.6	19.9	20.5	21.0	21.2	21.9	22.2	21.7	20.8	19.6	18.6	18.6	18.3	18.7	19.7	20.4	20.7	20.9	20.4	20.5	20.5	20.4	20.7
11:00a	23.5	22.3	21.5	21.5	21.3	20.9	20.4	20.2	19.7	20.0	20.7	21.2	21.5	22.0	22.3	21.9	20.8	19.7	18.8	18.7	18.4	19.0	20.0	20.5	21.0	21.1	20.4	20.5	20.7	20.5	20.6
12:00p	23.5	22.6	21.7	21.9	21.4	21.0	20.5	20.4	19.7	20.4	20.7	21.3	22.0	22.1	22.6	22.1	20.6	19.9	19.0	18.6	18.4	19.4	20.5	20.7	21.0	21.1	20.5	20.6	21.0	20.6	20.6
1:00p	23.8	22.8	21.8	22.3	21.7	21.0	20.5	20.5	19.9	20.5	21.0	21.5	22.3	22.1	22.7	22.4	20.6	20.1	19.2	18.6	18.5	19.6	21.2	20.8	21.0	21.1	20.4	20.5	21.3	20.8	20.8
2:00p	23.5	22.9	21.7	22.0	21.7	20.9	20.7	20.8	20.1	20.7	20.7	21.7	22.7	22.2	22.9	22.7	20.8	20.1	19.2	18.6	18.6	19.6	21.7	21.4	21.0	21.1	20.4	20.8	21.5	20.8	20.8
3:00p	23.8	22.9	21.9	22.1	21.7	21.0	20.9	21.0	20.2	20.8	20.9	21.6	23.0	22.3	23.0	22.9	20.5	20.2	19.3	18.7	18.6	20.0	21.8	21.3	21.2	21.2	20.5	20.9	21.6	20.8	21.0
4:00p	23.7	23.0	22.0	22.2	21.8	21.7	21.1	20.7	20.3	20.8	20.9	21.7	23.0	22.3	23.1	23.0	20.4	20.2	19.5	18.7	19.1	19.8	22.1	21.5	21.1	21.5	20.5	20.7	21.9	21.0	21.1
5:00p	24.2	23.0	21.9	22.3	21.8	21.8	21.2	21.2	20.4	21.1	21.1	21.7	23.3	22.4	23.1	23.2	20.5	20.2	19.8	18.7	19.0	20.0	22.1	21.2	21.2	21.4	20.5	20.9	21.8	21.0	20.8
6:00p	24.0	22.9	22.1	22.0	21.8	21.7	21.3	21.4	20.2	20.8	21.0	21.9	23.4	23.0	22.9	22.8	20.4	20.1	19.6	19.4	19.1	19.8	22.0	21.0	21.3	21.4	21.0	21.1	21.7	20.9	22.0
7:00p	23.9	22.8	22.2	22.3	21.7	21.7	21.2	20.7	20.3	20.6	21.1	21.8	23.1	23.2	22.8	22.6	20.4	20.0	19.6	19.4	19.2	20.5	21.7	20.9	21.5	21.4	21.2	21.0	21.5	20.8	22.6
8:00p	23.5	22.7	21.8	22.3	21.7	21.6	21.2	20.5	20.2	20.5	21.9	21.8	22.5	23.2	22.6	22.3	20.4	19.9	19.6	19.2	19.2	20.5	21.6	21.0	21.5	21.4	21.2	20.8	21.4	20.8	21.8
9:00p	23.5	22.6	22.0	22.4	21.6	21.4	21.1	20.3	20.2	20.4	21.6	21.7	22.2	23.2	22.6	22.2	20.3	19.7	19.9	19.1	19.1	20.7	21.4	21.1	21.4	21.3	21.1	20.8	21.3	20.7	21.5
10:00p	23.6	22.6	21.8	22.2	21.4	21.2	21.0	20.2	20.1	20.3	21.4	21.7	22.0	23.2	22.5	21.9	20.2	19.5	19.8	19.0	19.0	20.5	21.0	21.2	21.3	21.2	21.1	20.8	21.2	20.6	20.9
11:00p	23.3	22.5	21.7	21.9	21.4	21.0	20.8	20.1	19.9	20.3	20.8	21.6	21.8	22.9	22.3	21.7	20.2	19.4	19.7	18.9	19.2	20.4	20.9	21.5	21.2	21.1	20.9	20.7	21.0	20.5	20.8
Max.	24.2	23.2	22.3	22.4	21.8	21.8	21.3	21.4	20.4	21.1	21.9	21.9	23.4	23.2	23.1	23.2	21.4	20.2	19.9	19.6	19.2	20.7	22.1	21.5	21.8	21.5	21.2	21.1	21.9	21.0	22.6
Min.	22.6	22.1	21.4	20.8	21.1	20.9	20.3	20.1	19.6	19.5	19.9	20.3	21.0	21.4	22.0	21.4	20.2	19.4	18.3	18.4	18.1	18.5	19.1	19.9	20.5	20.8	20.2	20.4	20.3	20.2	20.4
Avg.	23.3	22.6	21.8	21.6	21.5	21.2	20.7	20.5	19.9	20.1	20.6	21.1	21.9	22.2	22.5	22.1	20.7	19.8	19.1	18.8	18.6	19.4	20.5	20.7	21.1	21.1	20.6	20.7	21.0	20.6	20.9

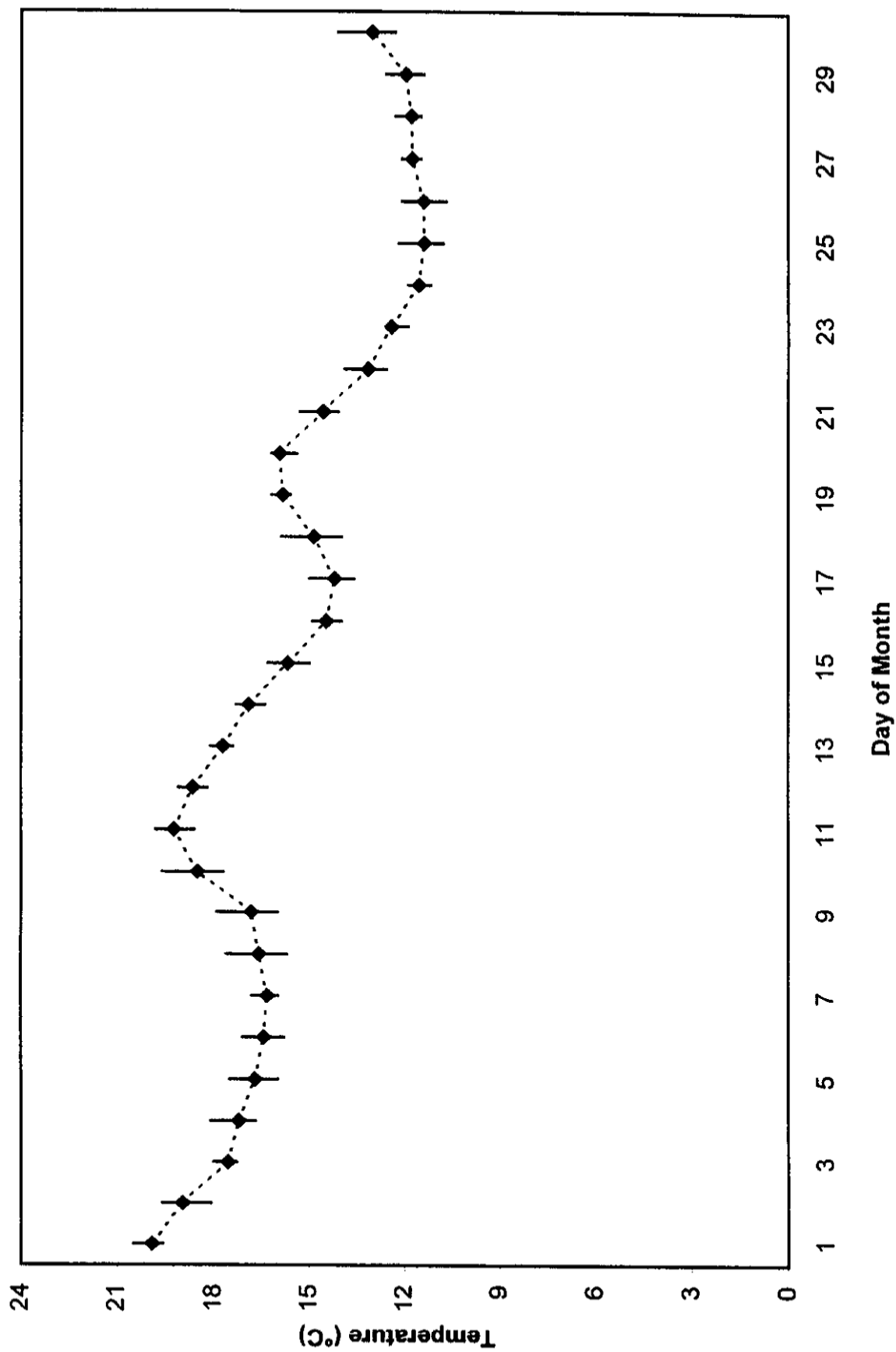
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
August 2000



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), September 2000

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	20.5	19.6	18.0	17.2	16.7	16.5	16.4	16.2	16.8	17.7	19.3	19.1	18.1	17.3	16.3	14.9	14.0	14.3	15.8	16.0	15.3	13.9	12.6	11.8	11.4	11.1	11.9	11.6	11.8	12.3
1:00a	20.5	19.6	17.9	17.2	16.6	16.5	16.4	16.1	16.4	17.7	19.2	19.1	18.0	17.2	16.2	14.7	13.9	14.2	15.7	16.0	15.1	13.9	12.6	11.6	11.3	10.9	11.8	11.6	11.7	12.3
2:00a	20.3	19.5	17.8	17.1	16.4	16.3	16.3	16.1	16.2	17.7	19.0	19.0	18.0	17.1	16.1	14.6	13.8	14.1	15.7	16.0	15.0	13.8	12.6	11.6	11.3	10.9	11.7	11.6	11.7	12.3
3:00a	20.3	19.5	17.7	17.1	16.3	16.2	16.3	16.0	16.2	17.8	18.9	18.9	17.8	17.1	16.0	14.4	13.8	14.1	15.7	15.9	14.8	13.6	12.6	11.4	11.2	10.8	11.6	11.6	11.6	12.4
4:00a	20.2	19.4	17.5	16.9	16.2	16.1	16.2	15.9	16.0	17.7	18.6	18.7	17.8	17.0	15.9	14.4	13.8	14.0	15.6	15.9	14.7	13.6	12.6	11.4	11.1	10.8	11.6	11.5	11.6	12.4
5:00a	20.2	19.4	17.5	16.8	16.2	16.0	16.2	15.9	16.0	17.8	18.6	18.6	17.6	16.8	15.7	14.3	13.8	14.0	15.6	15.9	14.5	13.5	12.6	11.3	11.1	10.8	11.6	11.5	11.6	12.4
6:00a	20.0	19.2	17.4	16.8	16.1	15.9	16.1	15.8	16.0	17.7	18.9	18.5	17.6	16.8	15.6	14.1	13.7	14.0	15.8	15.9	14.4	13.4	12.5	11.3	10.9	10.8	11.6	11.5	11.5	12.4
7:00a	20.0	19.2	17.3	16.7	16.0	15.9	16.0	15.7	16.0	17.7	18.9	18.4	17.5	16.7	15.6	14.0	13.7	14.0	15.6	15.8	14.4	13.4	12.3	11.3	10.9	10.7	11.5	11.6	11.4	12.4
8:00a	20.0	19.1	17.4	16.8	16.0	15.8	16.1	15.8	16.1	17.9	18.8	18.4	17.5	16.8	15.6	14.1	13.6	14.0	15.6	15.8	14.2	13.3	12.4	11.3	10.8	10.8	11.5	11.6	11.4	12.5
9:00a	19.9	19.1	17.4	16.8	16.2	15.9	16.1	16.0	16.2	18.0	18.9	18.4	17.4	16.7	15.6	14.1	13.8	14.1	15.6	15.8	14.2	13.2	12.5	11.2	11.0	10.9	11.5	11.6	11.5	12.6
10:00a	19.9	19.0	17.4	16.9	16.2	16.0	16.1	16.1	16.3	18.0	19.0	18.5	17.5	16.6	15.6	14.2	13.9	14.2	15.8	15.9	14.2	13.0	12.5	11.3	11.1	11.1	11.6	11.6	11.6	12.8
11:00a	19.9	19.0	17.5	17.1	16.4	16.2	16.1	16.5	16.4	18.2	19.2	18.5	17.6	16.8	15.6	14.3	14.0	14.7	15.8	15.9	14.4	13.1	12.4	11.4	11.1	11.3	11.6	11.7	11.8	13.0
12:00p	19.9	19.0	17.6	17.4	16.6	16.3	16.1	16.8	16.7	18.2	19.4	18.5	17.8	16.9	15.6	14.6	14.2	15.0	15.7	16.0	14.6	13.1	12.6	11.5	11.4	11.3	11.8	11.8	12.1	12.9
1:00p	19.8	19.0	17.6	17.5	17.0	16.5	16.2	16.9	16.8	18.5	19.5	18.6	17.9	17.0	15.7	14.7	14.4	15.2	15.9	16.2	14.7	13.1	12.6	11.6	11.6	11.6	11.9	11.9	12.2	13.1
2:00p	19.9	19.0	17.7	17.8	17.3	16.8	16.2	17.4	16.8	19.2	19.4	18.7	18.0	17.0	15.8	14.7	14.7	15.5	16.0	16.2	14.8	13.1	12.6	11.8	11.9	11.9	12.1	12.1	12.3	13.2
3:00p	19.9	19.0	17.8	17.9	17.4	16.8	16.5	17.4	17.1	19.5	19.5	18.7	18.0	17.1	15.9	14.8	14.9	15.5	16.2	16.2	14.8	12.9	12.6	11.9	12.2	12.0	12.1	12.2	12.6	13.2
4:00p	19.7	18.9	17.7	18.1	17.4	16.9	16.8	17.0	17.4	19.6	19.6	18.9	18.0	17.1	15.8	14.9	15.0	15.6	16.1	16.2	14.8	13.0	12.5	11.9	12.2	12.1	12.1	12.1	12.6	13.2
5:00p	19.7	18.6	17.6	17.8	17.4	17.1	16.8	17.2	17.7	19.4	19.7	18.8	17.7	17.1	15.8	14.9	14.7	15.8	16.1	16.2	14.7	12.9	12.5	11.9	12.1	12.0	12.1	12.3	12.5	13.6
6:00p	19.6	18.6	17.6	17.7	17.5	17.0	16.7	17.1	17.8	19.4	19.8	18.8	17.6	17.1	15.6	14.8	14.8	15.9	16.2	16.1	14.7	12.8	12.3	11.9	11.9	12.1	12.0	12.1	12.3	13.6
7:00p	19.6	18.6	17.4	17.4	17.3	16.9	16.6	17.2	17.6	19.5	19.6	18.7	17.6	16.8	15.6	14.8	14.7	15.6	16.0	16.1	14.5	12.8	12.3	11.8	11.8	12.1	11.9	12.1	12.4	13.9
8:00p	19.6	18.4	17.4	17.3	17.3	16.8	16.6	16.8	17.8	19.1	19.5	18.6	17.6	16.8	15.4	14.5	14.6	15.7	16.0	15.8	14.4	12.7	12.2	11.8	11.6	12.1	11.9	12.0	12.3	14.0
9:00p	19.7	18.3	17.4	17.2	17.1	16.8	16.6	17.6	17.8	18.9	19.6	18.6	17.5	16.8	15.3	14.4	14.5	15.8	15.9	15.7	14.3	12.7	12.1	11.7	11.5	12.1	11.8	11.9	12.2	14.0
10:00p	19.6	18.2	17.4	17.1	16.9	16.7	16.3	17.4	17.8	19.3	19.4	18.3	17.5	16.6	15.1	14.2	14.4	15.7	16.0	15.6	14.1	12.6	12.1	11.6	11.3	12.1	11.8	11.8	12.3	14.1
11:00p	19.6	18.1	17.3	16.8	16.8	16.6	16.3	17.1	17.9	19.4	19.3	18.2	17.4	16.4	15.0	14.0	14.4	15.7	16.0	15.4	14.1	12.6	11.9	11.4	11.0	11.8	11.7	11.8	12.3	13.9
Max.	20.5	19.6	18.0	18.1	17.5	17.1	16.8	17.6	17.9	19.6	19.8	19.1	18.1	17.3	16.3	14.9	15.0	15.9	16.2	16.2	15.3	13.9	12.6	11.9	12.2	12.1	12.1	12.3	12.6	14.1
Min.	19.6	18.1	17.3	16.7	16.0	15.8	16.0	15.7	16.0	17.7	18.6	18.2	17.4	16.4	15.0	14.0	13.6	14.0	15.6	15.4	14.1	12.6	11.9	11.2	10.8	10.7	11.5	11.5	11.4	12.3
Avg.	19.9	19.0	17.6	17.2	16.7	16.4	16.3	16.6	16.8	18.5	19.2	18.6	17.7	16.9	15.7	14.5	14.2	14.9	15.8	15.9	14.6	13.2	12.4	11.6	11.4	11.4	11.8	11.8	12.0	13.0

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
September 2000



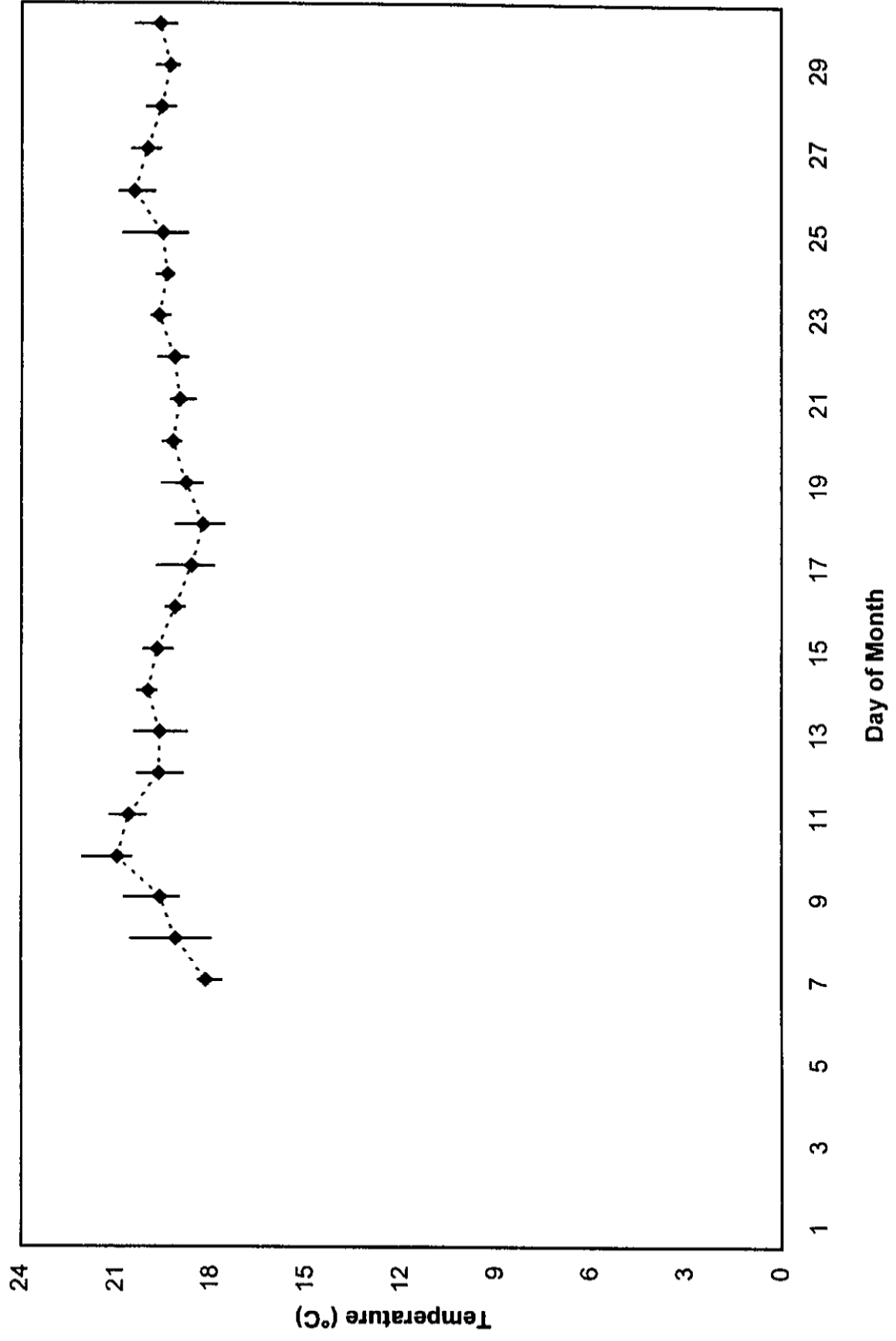
APPENDIX E

Downstream Temperature Monitoring

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																		
12:00a	18.22	19.73	20.81	21.21	20.34	19.63	20.34	20.06	19.44	18.77	18.44	18.75	19.54	19.25	19.01	19.57	19.31	19.35	20.88	20.53	20.06	19.16	19.16	18.18	19.75	20.77	21.04	20.06	19.50	20.25	19.99	19.38	18.65	18.22	18.65	19.45	19.19	18.97	19.63	19.30	19.31	20.91	20.48	20.04	19.18	19.14		
1:00a	18.17	19.64	20.77	20.86	19.87	19.38	20.16	19.90	19.37	18.51	18.05	18.56	19.40	19.11	18.97	19.71	19.30	19.28	20.93	20.41	20.02	19.19	19.13	18.15	19.66	20.74	20.76	19.69	19.23	20.06	19.82	19.30	18.39	17.93	18.49	19.31	19.02	18.95	19.73	19.30	19.23	20.91	20.32	20.04	19.18	19.13		
2:00a	18.10	19.57	20.69	20.58	19.50	19.14	19.97	19.71	19.23	18.27	17.83	18.42	19.25	18.90	18.94	19.73	19.30	19.16	20.88	20.23	19.57	19.14	19.14	18.07	19.37	20.63	20.46	19.33	19.02	19.90	19.61	19.18	18.17	17.76	18.37	19.19	18.80	18.90	19.69	19.30	19.04	20.81	20.15	19.87	19.11	19.13		
3:00a	18.03	19.21	20.58	20.34	19.31	18.90	19.85	19.52	19.13	18.05	17.66	18.32	19.14	18.70	18.85	19.64	19.30	18.92	20.67	20.06	19.71	19.06	19.13	18.03	19.13	20.55	20.25	19.16	18.80	19.78	19.42	19.06	17.96	17.62	18.29	19.11	18.56	18.78	19.63	19.31	18.83	20.48	19.95	19.71	19.04	19.13		
4:00a	18.07	19.04	20.58	20.15	19.11	18.78	19.76	19.37	19.06	17.95	17.61	18.34	19.11	18.53	18.77	19.66	19.30	18.78	20.28	19.89	19.69	19.04	19.14	18.20	19.04	20.69	20.11	18.92	18.82	19.75	19.30	19.07	17.93	17.62	18.44	19.09	18.53	18.80	19.68	19.28	18.78	20.13	19.80	19.68	19.11	19.18		
5:00a	18.42	19.04	20.81	20.09	18.95	18.97	19.76	19.25	18.99	17.98	17.67	18.65	19.09	18.61	18.83	19.73	19.25	18.80	19.94	19.68	19.64	19.19	19.21	18.77	19.04	20.90	20.11	19.13	19.28	19.75	19.35	18.94	18.03	17.76	18.83	19.07	18.80	18.89	19.80	19.30	18.85	19.82	19.66	19.57	19.23	19.31		
6:00a	17.69	19.11	19.09	20.93	20.20	19.31	19.38	19.78	19.44	19.06	18.20	17.88	18.89	19.07	18.95	19.04	19.90	19.35	19.06	19.83	19.52	19.25	19.59	17.86	19.61	19.16	20.88	20.35	19.44	19.75	19.80	19.59	19.13	18.37	18.00	18.87	19.06	19.13	19.18	19.89	19.54	19.35	19.92	19.66	19.42	19.31	19.89	
7:00p	17.96	19.95	19.28	20.83	20.53	19.66	19.83	19.90	19.76	19.19	18.66	18.20	18.85	19.06	19.28	19.40	19.85	19.54	19.54	20.06	19.68	19.63	20.11	18.08	20.11	19.44	20.81	20.74	19.92	20.08	20.01	19.95	19.21	19.02	18.54	18.89	18.99	19.26	19.63	19.87	19.54	19.82	20.18	19.80	19.38	19.64	20.28	
8:00p	18.17	20.53	19.63	20.90	20.91	20.09	20.30	20.11	20.13	19.25	19.42	18.82	18.92	19.11	19.23	19.69	19.75	19.61	20.02	20.37	19.97	19.30	19.68	20.39	18.29	20.49	19.85	21.02	21.12	20.32	20.23	20.15	20.13	19.25	19.61	19.04	19.09	19.44	19.18	19.68	19.69	19.73	20.13	20.44	20.15	19.33	19.69	20.42
9:00p	18.35	20.49	20.08	21.32	21.12	20.30	20.18	20.20	20.15	19.23	19.73	19.13	19.14	19.33	19.23	19.59	19.63	19.75	20.30	20.55	20.18	19.47	19.75	20.34	18.39	20.46	20.20	22.08	21.14	20.25	20.42	20.21	20.02	19.19	19.66	19.04	19.14	19.37	19.25	19.54	19.57	19.54	20.39	20.58	20.15	19.30	19.69	19.92
10:00p	18.37	20.55	20.39	21.90	21.04	20.02	20.44	20.23	19.87	19.16	19.33	18.95	19.19	19.38	19.26	19.54	19.50	19.49	20.49	20.58	20.09	19.30	19.57	20.23	18.37	19.90	20.51	21.72	20.86	19.87	20.44	20.23	19.73	19.07	19.14	18.99	19.30	19.30	19.21	19.47	19.44	19.47	20.60	20.58	20.06	19.25	19.44	20.16
11:00p	18.32	19.83	20.65	21.44	20.67	19.78	20.42	20.20	19.61	18.97	18.92	18.97	19.40	19.38	19.14	19.47	19.37	19.42	20.70	20.56	20.13	19.19	19.30	20.02	18.27	19.87	20.76	21.37	20.51	19.71	20.39	20.13	19.50	18.87	18.70	18.87	19.56	19.26	19.06	19.50	19.33	19.38	20.81	20.55	20.11	19.16	19.21	19.94
Max.	18.39	20.55	20.76	22.08	21.21	20.34	20.44	20.34	20.15	19.44	19.73	19.13	19.56	19.54	19.28	19.69	19.90	18.75	20.81	20.93	20.53	20.06	19.75	20.42	17.69	18.03	19.04	20.55	20.09	18.92	18.78	19.75	19.25	18.87	17.93	17.61	18.29	18.99	18.53	18.77	19.33	19.25	18.78	19.82	19.63	19.16	19.04	19.13
Avg.	18.18	19.14	19.64	20.99	20.63	19.67	19.64	20.01	19.72	19.16	18.64	18.28	18.81	19.23	19.01	19.18	19.67	19.41	19.56	20.45	20.03	19.59	19.32	19.63																								

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
June 2000

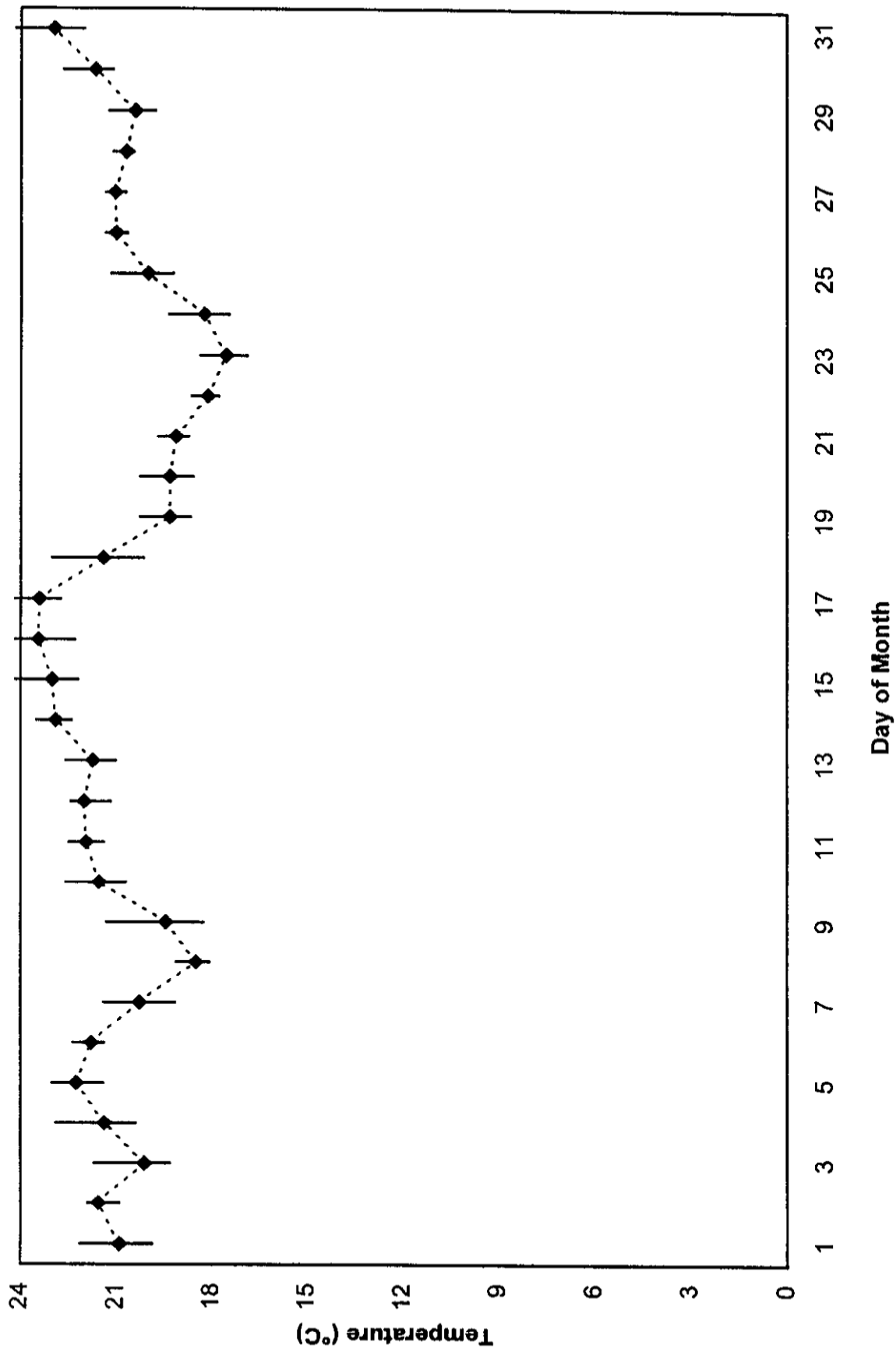


Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), July 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	1995	2162	2070	2041	2148	2236	2139	1913	1829	2133	2250	2241	2118	2249	2274	2301	2362	2302	1999	1913	1866	1771	1820	1957	2118	2119	2087	2046	2125	2209	
1:00a	1992	2156	2046	2041	2144	2218	2123	1907	1830	2135	2245	2243	2114	2243	2265	2293	2342	2284	1976	1906	1858	1756	1810	1975	2118	2116	2081	2043	2129	2205	
2:00a	1992	2153	2025	2042	2142	2202	2109	1904	1835	2130	2238	2241	2112	2241	2256	2284	2329	2268	1957	1894	1952	1842	1742	1796	1969	2112	2111	2078	2038	2129	2205
3:00a	1990	2148	2004	2044	2144	2181	2097	1902	1835	2123	2227	2243	2112	2243	2247	2268	2322	2249	1940	1880	1942	1832	1730	1786	1952	2107	2104	2074	2029	2127	2203
4:00a	1992	2142	1989	2046	2148	2167	2077	1894	1837	2114	2211	2243	2109	2243	2240	2256	2311	2231	1919	1870	1933	1818	1718	1774	1940	2100	2098	2078	2019	2125	2203
5:00a	1995	2140	1971	2049	2153	2158	2063	1889	1839	2107	2195	2241	2105	2245	2233	2245	2301	2211	1906	1865	1925	1807	1712	1762	1933	2095	2093	2085	2008	2124	2203
6:00a	2001	2140	1954	2055	2163	2149	2049	1882	1835	2097	2174	2234	2105	2247	2225	2234	2290	2190	1894	1863	1923	1796	1701	1752	1928	2091	2086	2097	1996	2118	2203
7:00a	2008	2144	1940	2062	2174	2146	2037	1878	1832	2086	2155	2225	2104	2245	2222	2231	2279	2174	1873	1865	1921	1786	1693	1749	1926	2086	2081	2108	1985	2113	2203
8:00a	2018	2153	1942	2070	2188	2140	2034	1866	1835	2074	2144	2218	2107	2250	2229	2234	2275	2162	1870	1868	1918	1781	1691	1752	1930	2086	2076	2110	1982	2113	2211
9:00a	2034	2162	1942	2086	2201	2144	2034	1859	1849	2072	2140	2213	2116	2261	2241	2258	2283	2146	1871	1871	1914	1786	1698	1767	1938	2076	2074	2097	1985	2120	2219
10:00a	2051	2170	1935	2104	2217	2149	2034	1849	1858	2079	2139	2211	2132	2277	2254	2301	2299	2132	1895	1878	1913	1800	1712	1788	1956	2070	2076	2087	1996	2125	2234
11:00a	2074	2181	1944	2130	2240	2160	2037	1839	1878	2100	2146	2213	*	2293	2275	2317	2313	2118	1907	1887	1913	1810	1729	1812	1954	2069	2085	2073	1999	2136	2257
12:00p	2095	2185	1964	2139	2254	2169	2035	1830	1897	2111	2162	2211	2178	2308	2290	2364	2333	2114	1919	1909	1909	1810	1742	1839	1975	2072	2110	2057	2017	2147	2329
1:00p	2125	2188	1987	2151	2274	2174	2041	1820	1930	2123	2160	2209	2202	2331	2301	2382	2364	2109	1945	1940	1904	1812	1752	1863	1997	2081	2117	2062	2043	2159	2398
2:00p	2156	2190	2025	2181	2283	2186	2037	1810	1975	2158	2192	2208	2199	2342	2353	2367	2385	2105	1980	1966	1906	1813	1756	1871	2008	2086	2125	2060	2034	2177	2422
3:00p	2162	2190	2041	2233	2302	2192	2018	1808	2016	2172	2176	2199	2217	2342	2362	2382	2411	2102	2027	1994	1909	1815	1767	1859	2028	2097	2134	2066	2041	2211	2387
4:00p	2190	2185	2104	2275	2292	2201	2013	1817	2046	2199	2178	2202	2229	2351	2376	2471	2422	2095	1949	2013	1909	1822	1779	1853	2044	2112	2127	2053	2050	2268	2415
5:00p	2208	2174	2116	2270	2299	2215	2008	1829	2077	2206	2188	2188	2241	2351	2420	2468	2422	2091	1947	2021	1906	1829	1791	1849	2065	2121	2127	2050	2074	2264	2383
6:00p	2204	2167	2170	2290	2299	2215	1990	1827	2100	2227	2199	2169	2249	2344	2422	2471	2409	2081	1947	2027	1904	1832	1796	1851	2084	2126	2125	2053	2089	2243	2389
7:00p	2215	2160	2044	2270	2295	2209	1973	1820	2107	2243	2224	2160	2250	2340	2407	2473	2391	2076	1957	2021	1902	1830	1839	1861	2093	2123	2134	2055	2097	2230	2400
8:00p	2204	2146	2025	2245	2284	2197	1961	1822	2114	2254	2233	2148	2250	2331	2360	2462	2371	2060	1949	2016	1897	1825	1830	1877	2102	2135	2124	2053	2117	2203	2378
9:00p	2183	2132	2032	2178	2277	2181	1944	1824	2116	2258	2238	2135	2254	2313	2344	2448	2349	2048	1930	2004	1890	1812	1822	1902	2109	2135	2104	2050	2125	2207	2382
10:00p	2163	2116	2042	2160	2265	2165	1926	1827	2125	2256	2240	2126	2258	2302	2329	2407	2331	2028	1923	1990	1885	1801	1827	1916	2114	2130	2099	2050	2122	2209	2347
11:00p	2170	2093	2037	2156	2252	2155	1918	1825	2130	2250	2240	2119	2250	2286	2315	2367	2317	2018	1990	1980	1877	1786	1820	1938	2118	2121	2092	2050	2122	2216	2327
Max.	2215	2190	2170	2290	2302	2236	2139	1913	2130	2258	2250	2243	2258	2351	2422	2473	2422	2302	2027	2027	1971	1866	1839	1938	2118	2135	2134	2110	2125	2268	2422
Min.	1990	2093	1935	2041	2142	2140	1918	1808	1829	2072	2139	2119	2104	2241	2222	2231	2275	2018	1870	1863	1877	1781	1691	1749	1926	2069	2074	2050	1982	2113	2203
Avg.	2092	2157	2015	2138	2227	2180	2029	1852	1947	2154	2196	2202	2174	2291	2302	2345	2342	2141	1936	1935	1916	1815	1757	1827	2004	2103	2106	2071	2044	2167	2296

* indicates missing reading due to servicing

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
July 2000

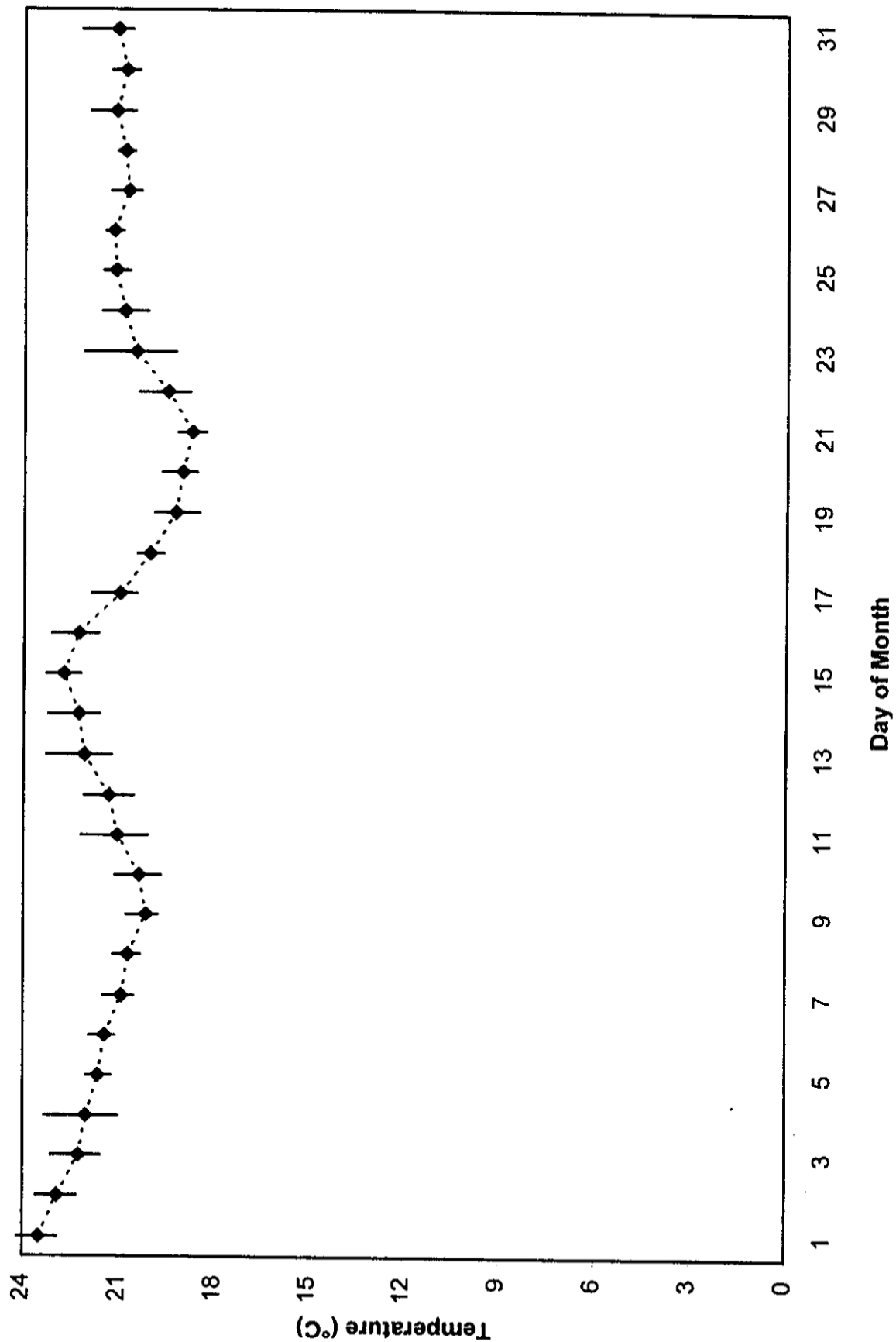


Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), August 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	23.31	23.58	22.65	21.81	22.02	21.69	21.18	21.16	20.16	20.20	20.55	21.28	21.81	22.13	22.90	22.49	21.88	20.39	19.59	19.68	19.06	19.16	20.08	21.04	21.44	21.30	21.28	21.04	20.90	21.25	20.77
1:00a	23.20	23.47	22.52	21.63	21.88	21.60	21.00	21.04	20.02	20.08	20.48	21.12	21.76	22.02	22.83	22.34	21.69	20.34	19.44	19.59	19.01	19.13	19.92	20.91	21.53	21.19	21.12	20.97	20.86	21.14	20.74
2:00a	23.09	23.31	22.40	21.46	21.67	21.53	20.88	20.93	20.06	19.99	20.39	20.97	21.72	21.92	22.77	22.20	21.55	20.28	19.25	19.44	18.90	19.11	19.85	20.77	21.51	21.14	20.98	20.93	20.83	21.04	20.69
3:00a	23.04	23.15	22.25	21.37	21.49	21.46	20.77	20.81	19.99	19.92	20.32	20.88	21.65	21.83	22.70	22.09	21.44	20.16	19.07	19.23	18.80	19.04	19.69	20.65	21.44	21.11	20.86	20.90	20.81	20.91	20.69
4:00a	22.97	22.98	22.09	21.30	21.40	21.40	20.70	20.74	20.02	19.85	20.25	20.74	21.56	21.74	22.59	21.95	21.33	20.06	18.92	19.06	18.70	18.99	19.56	20.53	21.25	21.09	20.69	20.86	20.79	20.79	20.67
5:00a	22.95	22.84	21.90	21.25	21.33	21.33	20.65	20.69	19.95	19.80	20.21	20.67	21.46	21.69	22.47	21.85	21.25	19.99	18.78	18.89	18.59	18.92	19.44	20.41	21.11	21.07	20.58	20.76	20.76	20.69	20.67
6:00a	22.93	22.73	21.74	21.18	21.28	21.28	20.62	20.62	19.92	19.75	20.16	20.62	21.33	21.63	22.38	21.78	21.16	19.87	18.66	18.78	18.49	18.87	19.37	20.30	20.95	21.04	20.48	20.69	20.69	20.58	20.65
7:00a	22.95	22.57	21.63	21.09	21.26	21.23	20.58	20.56	19.89	19.69	20.11	20.56	21.28	21.62	22.27	21.70	21.07	19.75	18.56	18.68	18.39	18.83	19.28	20.20	20.83	20.98	20.39	20.63	20.62	20.48	20.63
8:00a	22.98	22.44	21.58	21.05	21.30	21.18	20.56	20.49	19.82	19.69	20.15	20.56	21.23	21.63	22.24	21.65	21.04	19.64	18.53	18.61	18.34	18.83	19.28	20.15	20.74	20.93	20.37	20.58	20.56	20.42	20.65
9:00a	23.13	22.36	21.67	21.11	21.37	21.18	20.55	20.44	19.80	19.78	20.27	20.62	21.26	21.70	22.20	21.65	20.98	19.63	18.56	18.61	18.32	18.89	19.35	20.18	20.72	20.93	20.41	20.58	20.56	20.44	20.69
10:00a	23.31	22.32	21.76	21.28	21.44	21.14	20.55	20.39	19.80	19.95	20.46	20.79	21.32	21.79	22.29	21.70	20.98	19.66	18.66	18.66	18.35	19.04	19.56	20.32	20.74	21.00	20.46	20.58	20.60	20.51	20.70
11:00a	23.44	22.39	21.97	21.67	21.51	21.14	20.56	20.37	19.83	20.11	20.72	20.98	21.46	21.99	22.41	21.85	20.97	19.76	18.82	18.70	18.35	19.14	19.82	20.53	20.84	21.04	20.51	20.63	20.72	20.62	20.81
12:00p	23.91	22.61	22.24	22.01	21.63	21.16	20.60	20.39	19.89	*	21.11	21.28	21.72	22.11	22.58	22.06	20.91	19.92	18.95	18.75	18.37	19.33	20.13	20.65	20.97	21.11	20.58	20.69	20.88	20.63	20.88
1:00p	24.49	22.88	22.33	22.36	21.70	21.18	20.63	20.44	19.97	20.55	21.48	21.44	22.09	22.22	22.75	22.36	20.84	20.08	19.11	18.83	18.46	19.50	20.48	20.91	21.09	21.14	20.62	20.74	21.12	20.74	20.95
2:00p	23.83	23.02	22.36	22.70	21.70	21.26	20.81	20.60	20.15	20.76	21.65	21.55	22.41	22.34	22.95	22.61	20.83	20.23	19.44	18.90	18.59	19.66	20.86	21.12	21.11	21.18	20.62	20.83	21.32	20.83	21.05
3:00p	23.85	23.15	22.40	22.93	21.74	21.30	20.98	20.83	20.32	20.98	21.72	21.76	22.68	22.45	23.11	22.72	20.77	20.30	19.54	18.99	18.75	19.90	21.30	21.33	21.09	21.28	20.65	20.90	21.51	*	21.14
4:00p	23.82	23.20	22.50	23.01	21.83	21.39	21.18	21.02	20.51	21.09	21.86	21.79	22.93	22.50	23.22	22.97	20.74	20.37	19.59	19.07	18.87	20.01	21.72	21.55	21.18	21.32	20.72	20.93	21.69	20.93	21.25
5:00p	23.78	23.28	22.36	23.04	21.90	21.81	21.33	21.14	20.63	21.11	21.92	21.86	23.17	22.58	23.28	23.11	20.70	20.44	19.78	19.11	18.94	20.09	22.01	21.39	21.14	21.35	20.79	21.02	21.85	20.98	21.23
6:00p	23.96	23.24	22.38	23.15	21.93	21.92	21.42	21.11	20.77	21.07	22.04	22.04	23.28	22.72	23.24	23.04	20.67	20.44	19.89	19.19	18.99	20.21	22.11	21.32	21.16	21.40	20.86	21.04	21.93	21.04	21.63
7:00p	23.94	23.19	23.11	23.13	21.93	21.88	21.48	21.18	20.67	21.09	22.09	22.06	23.24	23.20	23.15	22.83	20.63	20.34	19.89	19.23	19.07	20.32	22.04	21.21	21.30	21.42	20.95	21.07	21.85	21.05	22.08
8:00p	23.89	23.08	22.99	23.31	21.92	21.92	21.44	20.97	20.55	20.97	22.08	22.08	23.13	23.10	23.02	22.61	20.60	20.18	19.90	19.33	19.16	20.41	21.81	21.21	21.32	21.44	20.98	21.05	21.72	21.02	22.18
9:00p	23.89	22.97	22.86	22.38	21.88	21.70	21.40	20.72	20.44	20.90	22.18	21.99	22.77	23.11	22.86	22.45	20.58	20.02	19.80	19.33	19.18	20.34	21.58	21.23	21.35	21.42	21.04	21.62	20.93	21.95	
10:00p	23.78	22.88	22.52	22.29	21.83	21.56	21.33	20.49	20.35	20.69	21.81	21.97	22.54	23.22	22.75	22.27	20.51	19.87	19.75	19.25	19.19	20.23	21.44	21.30	21.30	21.42	21.09	21.00	21.49	20.88	21.62
11:00p	23.67	22.79	21.97	22.22	21.76	21.33	21.26	20.34	20.27	20.60	21.42	21.86	22.31	23.17	22.63	22.04	20.48	19.71	19.71	19.16	19.16	20.15	21.23	21.40	21.30	21.37	21.05	20.93	21.37	20.83	21.33
Max.	24.49	23.58	23.11	23.31	22.02	21.92	21.48	21.18	20.77	21.11	22.18	22.08	23.28	23.22	23.28	23.11	21.88	20.44	19.90	19.68	19.19	20.41	22.11	21.55	21.53	21.44	21.28	21.07	21.93	21.25	22.18
Min.	22.93	22.32	21.58	21.05	21.26	21.14	20.55	20.34	19.80	19.69	20.11	20.56	21.23	21.62	22.20	21.65	20.48	19.63	18.53	18.61	18.32	18.83	19.28	20.15	20.72	20.93	20.37	20.58	20.56	20.42	20.63
Avg.	23.50	22.93	22.26	22.03	21.65	21.44	20.94	20.73	20.16	20.37	21.06	21.31	22.09	22.27	22.73	22.26	20.98	20.06	19.26	19.04	18.75	19.50	20.50	20.86	21.14	21.19	20.75	20.85	21.13	20.81	21.07

* Service point (missing data)

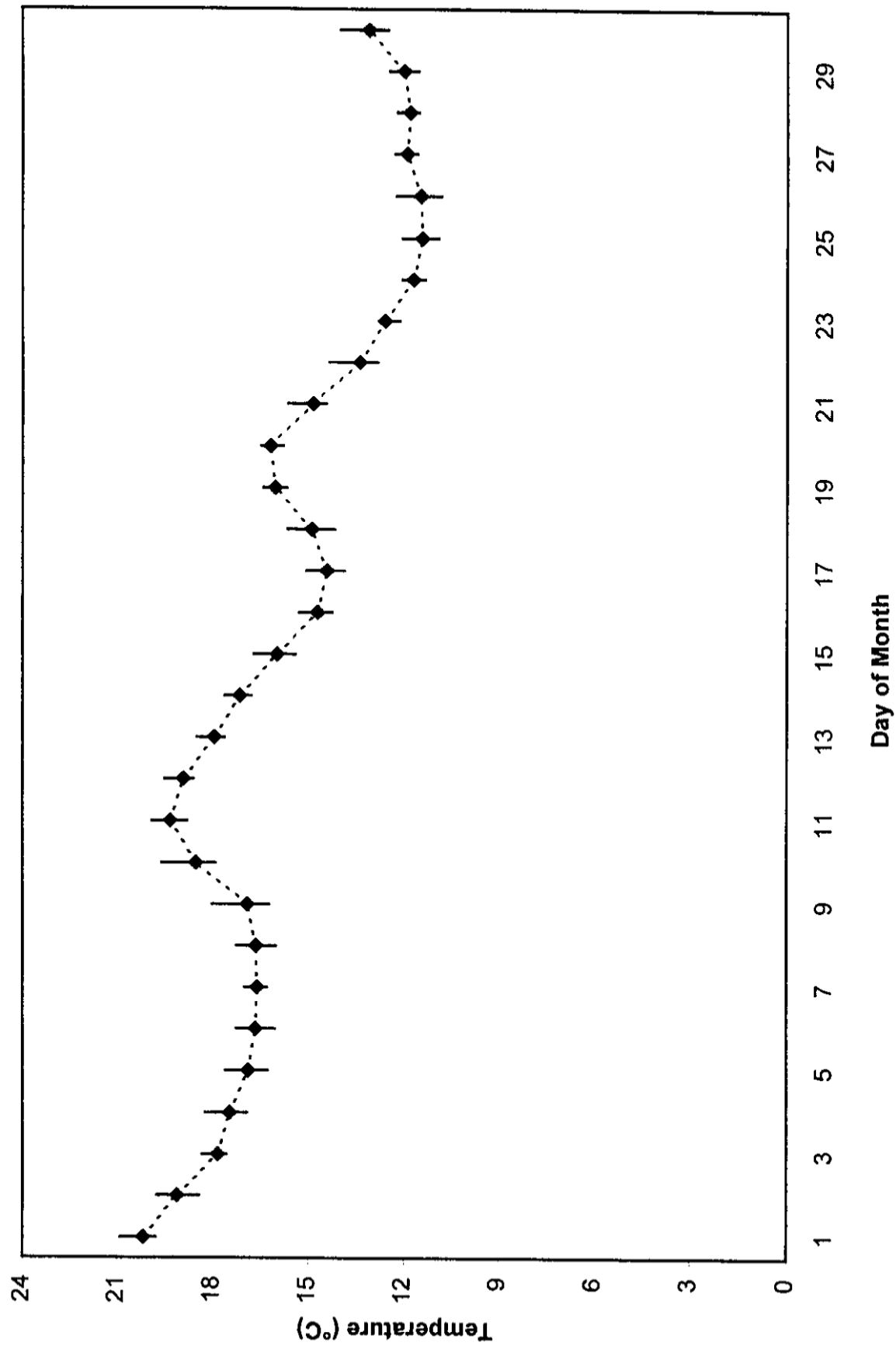
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
August 2000



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), September 2000

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	20.90	19.75	18.32	17.54	17.08	17.07	16.85	16.58	17.08	18.00	19.23	19.50	18.49	17.62	16.71	15.29	14.32	14.69	15.69	16.31	15.64	14.36	12.79	12.02	11.64	11.20	12.13	11.80	11.89	12.49
1:00a	20.74	19.73	18.24	17.49	16.91	16.91	16.75	16.49	16.88	17.98	19.19	19.38	18.37	17.54	16.59	15.15	14.24	14.61	15.82	16.27	15.49	14.24	12.79	11.91	11.58	11.12	12.10	11.72	11.84	12.51
2:00a	20.65	19.73	18.17	17.42	16.81	16.75	16.69	16.43	16.68	17.95	19.09	19.30	18.25	17.47	16.49	14.99	14.14	14.49	15.86	16.24	15.35	14.10	12.74	11.79	11.46	11.02	11.98	11.69	11.82	12.54
3:00a	20.58	19.66	18.07	17.35	16.68	16.61	16.63	16.36	16.53	17.91	19.01	19.19	18.15	17.39	16.38	14.84	14.06	14.42	15.82	16.21	15.19	13.96	12.74	11.68	11.40	10.95	11.84	11.61	11.80	12.55
4:00a	20.51	19.61	17.95	17.29	16.56	16.51	16.56	16.27	16.38	17.93	18.90	19.09	18.01	17.30	16.27	14.72	14.01	14.36	15.84	16.17	15.04	13.84	12.71	11.58	11.30	10.95	11.79	11.59	11.72	12.61
5:00a	20.42	19.50	17.84	17.17	16.46	16.41	16.48	16.21	16.29	17.95	18.83	18.97	17.95	17.22	16.11	14.57	13.98	14.29	15.84	16.12	14.91	13.75	12.71	11.52	11.22	10.89	11.72	11.58	11.68	12.61
6:00a	20.35	19.38	17.71	17.10	16.44	16.31	16.41	16.14	16.22	17.98	18.80	18.85	17.84	17.10	16.01	14.47	13.96	14.21	15.86	16.09	14.77	13.66	12.67	11.43	11.12	10.84	11.68	11.54	11.66	12.61
7:00a	20.27	19.30	17.67	17.00	16.36	16.19	16.34	16.06	16.22	17.96	18.87	18.75	17.76	17.00	15.89	14.34	13.93	14.19	15.84	16.06	14.66	13.58	12.60	11.40	11.04	10.84	11.64	11.53	11.58	12.62
8:00a	20.20	19.21	17.62	16.93	16.31	16.09	16.29	16.01	16.22	17.96	18.82	18.66	17.73	16.93	15.79	14.26	13.89	14.19	15.82	16.04	14.59	13.50	12.54	11.33	10.94	10.82	11.62	11.54	11.56	12.59
9:00a	20.16	19.14	17.57	16.95	16.29	16.04	16.31	16.02	16.24	18.00	18.94	18.65	17.66	16.91	15.74	14.26	13.93	14.22	15.82	16.06	14.51	13.41	12.53	11.33	10.91	10.86	11.58	11.56	11.54	12.66
10:00a	20.13	19.13	17.61	16.98	16.27	16.09	16.31	16.11	16.32	18.08	19.01	18.66	17.64	16.88	15.74	14.29	13.96	14.34	15.87	16.09	14.47	13.35	12.54	11.33	10.94	10.94	11.58	11.58	11.59	12.69
11:00a	20.11	19.04	17.67	17.08	16.44	16.16	16.36	16.26	16.39	18.20	19.11	18.73	17.71	16.80	15.79	14.36	14.09	14.46	15.94	16.07	14.46	13.30	12.57	11.41	11.04	11.05	11.64	11.64	11.68	12.84
12:00p	20.09	19.02	17.74	17.25	16.61	16.27	16.38	16.51	16.51	18.37	19.30	18.71	17.79	16.95	15.82	14.51	14.26	14.67	15.99	16.12	14.56	13.23	12.64	11.46	11.18	11.25	11.71	11.68	11.81	13.07
1:00p	20.08	19.01	17.74	17.42	16.75	16.46	16.41	16.71	16.68	18.53	19.44	18.70	17.90	17.12	15.82	14.62	14.46	14.99	16.02	16.24	14.71	13.20	12.66	11.56	11.31	11.46	11.82	11.76	11.99	13.24
2:00p	20.06	18.99	17.84	17.62	16.96	16.59	16.46	16.98	16.90	18.71	19.52	18.82	17.98	17.18	15.91	14.79	14.67	15.30	16.12	16.34	14.86	13.18	12.74	11.71	11.53	11.71	11.99	11.87	12.14	13.35
3:00p	20.04	19.01	18.00	17.90	17.12	16.71	16.56	17.18	17.03	18.83	19.59	18.89	18.05	17.23	16.06	14.86	14.84	15.43	16.22	16.46	14.94	13.17	12.74	11.90	11.71	11.97	12.10	12.03	12.32	13.46
4:00p	20.02	18.99	17.98	18.13	17.29	16.85	16.69	17.13	17.15	19.26	19.71	18.95	18.17	17.27	16.11	14.94	14.97	15.51	16.32	16.48	14.97	13.16	12.74	12.00	11.82	12.10	12.26	12.13	12.36	13.51
5:00p	19.99	18.89	17.96	18.22	17.39	17.25	16.88	17.15	17.37	19.50	19.76	19.01	18.13	17.29	16.07	15.06	15.06	15.45	16.38	16.46	14.97	13.13	12.71	12.05	12.04	12.20	12.27	12.16	12.43	13.58
6:00p	19.94	18.83	17.90	18.15	17.49	17.12	16.98	17.10	17.54	19.59	19.76	19.02	18.03	17.32	16.02	15.10	15.07	15.59	16.41	16.43	14.96	13.07	12.61	12.03	11.98	12.21	12.20	12.20	12.36	13.71
7:00p	19.89	18.75	17.84	17.96	17.59	17.22	17.00	17.15	17.69	19.52	19.85	19.01	17.98	17.23	15.91	15.09	15.01	15.64	16.36	16.32	14.89	12.99	12.51	11.99	11.84	12.21	12.13	12.18	12.33	13.84
8:00p	19.85	18.66	17.81	17.84	17.49	17.13	16.98	17.17	17.78	19.13	19.90	18.92	17.91	17.10	15.79	14.96	14.97	15.66	16.34	16.21	14.82	12.94	12.41	11.94	11.75	12.21	12.07	12.12	12.35	13.83
9:00p	19.85	18.59	17.69	17.69	17.44	17.05	16.91	17.18	17.90	19.07	19.80	18.87	17.86	17.00	15.66	14.72	14.91	15.64	16.29	16.09	14.72	12.90	12.31	11.87	11.63	12.18	11.99	12.04	12.38	13.89
10:00p	19.83	18.49	17.64	17.51	17.39	17.01	16.80	17.25	17.98	19.07	19.71	18.77	17.78	16.91	15.54	14.54	14.84	15.66	16.27	15.94	14.61	12.87	12.18	11.79	11.51	12.23	11.92	11.95	12.38	13.84
11:00p	19.78	18.42	17.59	17.29	17.20	16.93	16.68	17.15	18.01	19.11	19.61	18.61	17.71	16.83	15.42	14.44	14.76	15.66	16.31	15.79	14.49	12.84	12.13	11.72	11.38	12.18	11.86	11.94	12.44	14.01
Max.	20.90	19.75	18.32	18.22	17.59	17.25	17.00	17.25	18.01	19.59	19.90	19.50	18.49	17.62	16.71	15.29	15.07	15.66	16.41	16.48	15.64	14.36	12.79	12.05	12.04	12.23	12.27	12.20	12.44	14.01
Min.	19.78	18.42	17.57	16.93	16.27	16.04	16.29	16.01	16.22	17.91	18.80	18.61	17.64	16.80	15.42	14.26	13.89	14.19	15.69	15.79	14.46	12.84	12.13	11.33	10.91	10.82	11.58	11.53	11.54	12.49
Avg.	20.19	19.12	17.84	17.47	16.89	16.66	16.61	16.65	16.92	18.52	19.33	18.92	17.95	17.15	15.99	14.72	14.43	14.90	16.04	16.19	14.86	13.41	12.60	11.70	11.43	11.47	11.90	11.81	11.99	13.11

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
September 2000



APPENDIX F

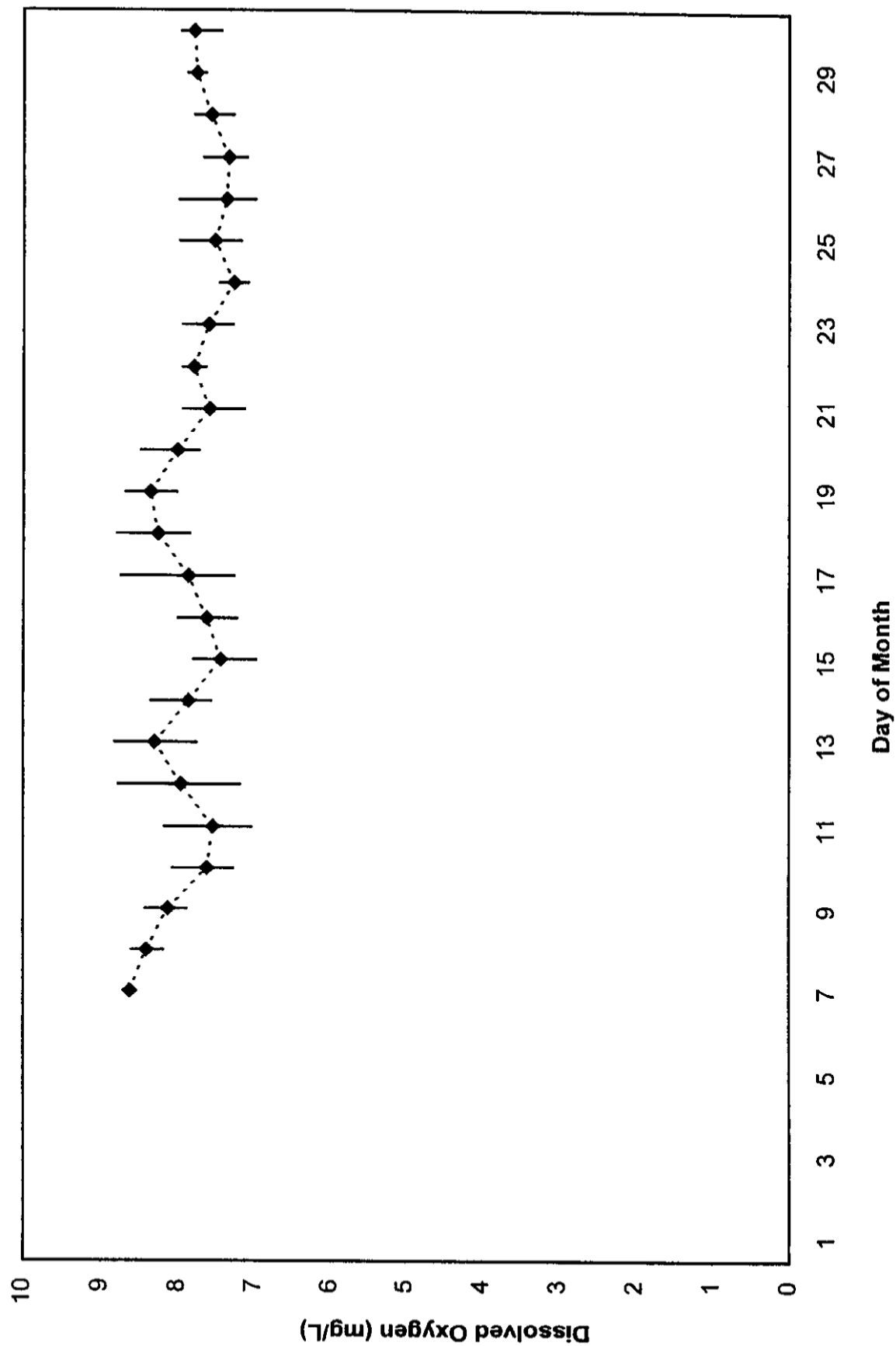
Downstream Dissolved Oxygen Monitoring

Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), June 2000

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a							8.60	8.42	8.07	7.67	7.57	8.31	8.35	7.70	7.56	7.74	8.42	8.68	8.48	7.73	7.79	7.78	7.39	7.46	7.99	7.37	7.74	7.70	7.78	
1:00a							8.59	8.35	8.06	7.61	7.58	8.28	8.23	7.67	7.53	7.70	8.39	8.61	8.46	7.66	7.85	7.81	7.42	7.53	7.96	7.37	7.79	7.76	7.82	
2:00a							8.56	8.29	7.97	7.54	7.47	8.19	8.10	7.52	7.52	7.62	8.30	8.55	8.42	7.56	7.90	7.84	7.42	7.54	7.95	7.38	7.79	7.78	7.88	
3:00a							8.50	8.20	7.89	7.48	7.41	8.06	8.00	7.46	7.52	7.56	8.15	8.36	8.34	7.43	7.92	7.91	7.46	7.56	7.88	7.38	7.79	7.76	7.92	
4:00a							8.46	8.11	7.76	7.30	7.34	7.92	7.88	7.35	7.44	7.49	8.05	8.34	8.28	7.31	7.94	7.91	7.43	7.54	7.79	7.34	7.77	7.76	7.96	
5:00a							8.42	8.14	7.61	7.23	7.33	7.85	7.77	7.28	7.39	7.44	7.96	8.26	8.23	7.30	7.93	7.94	7.41	7.49	7.65	7.32	7.71	7.75	7.95	
6:00a							8.41	8.08	7.45	7.13	7.19	7.80	7.67	7.22	7.31	7.36	7.89	8.12	8.11	7.20	7.90	7.88	7.37	7.37	7.54	7.23	7.66	7.71	7.92	
7:00a							8.29	7.99	7.35	7.08	7.19	7.77	7.63	7.10	7.26	7.29	7.87	8.03	8.02	7.14	7.84	7.84	7.33	7.28	7.38	7.19	7.59	7.65	7.92	
8:00a							8.21	7.92	7.30	7.04	7.35	7.76	7.59	7.01	7.23	7.27	7.86	8.02	7.94	7.15	7.77	7.78	7.27	7.22	7.26	7.15	7.56	7.65	7.89	
9:00a							8.19	7.89	7.28	7.04	7.43	7.82	7.58	6.98	7.28	7.29	7.85	8.03	7.85	7.22	7.73	7.76	7.23	7.18	7.14	7.11	7.53	7.64	7.89	
10:00a							8.19	7.89	7.34	7.07	7.56	7.91	7.58	7.03	7.39	7.32	7.86	8.09	7.81	7.39	7.68	7.68	7.18	7.19	7.07	7.10	7.46	7.68	7.87	
11:00a							8.23	7.93	7.38	7.21	7.73	8.13	7.57	7.06	7.50	7.43	7.88	8.14	7.78	7.55	7.64	7.60	7.12	7.21	7.00	7.11	7.42	7.71	7.84	
12:00p							8.60	8.26	7.91	7.36	7.25	7.93	8.33	7.63	7.19	7.59	7.55	7.97	8.15	7.76	7.66	7.70	7.59	7.13	7.23	6.99	7.14	7.36	7.67	7.85
1:00p							8.60	8.29	7.97	7.31	7.39	8.18	8.44	7.68	7.33	7.57	7.72	8.09	8.22	7.73	7.82	7.75	7.58	7.13	7.31	7.04	7.17	7.35	7.74	7.86
2:00p							8.59	8.33	7.93	7.36	7.53	8.40	8.59	7.73	7.41	7.70	7.88	8.17	8.28	7.75	7.84	7.78	7.49	7.18	7.39	7.10	7.18	7.34	7.76	7.83
3:00p							8.59	8.39	8.01	7.39	7.69	8.58	8.72	7.92	7.52	7.83	8.05	8.28	8.32	7.83	7.94	7.78	7.47	7.09	7.48	7.10	7.27	7.34	7.80	7.83
4:00p							8.63	8.42	8.10	7.46	7.82	8.64	8.82	8.07	7.66	7.91	8.22	8.40	8.41	7.83	7.91	7.80	7.35	7.10	7.56	7.21	7.37	7.28	7.82	7.78
5:00p							8.61	8.50	8.17	7.54	8.01	8.72	8.82	8.12	7.71	7.96	8.49	8.49	8.52	7.96	7.82	7.83	7.29	7.19	7.69	7.23	7.47	7.53	7.83	7.76
6:00p							8.64	8.54	8.25	7.66	8.14	8.77	8.82	8.09	7.79	7.96	8.70	8.63	8.57	8.03	7.84	7.76	7.34	7.21	7.75	7.23	7.49	7.61	7.85	7.69
7:00p							8.62	8.52	8.36	7.93	8.17	8.69	8.73	7.99	7.80	8.00	8.74	8.71	8.63	8.02	7.77	7.74	7.30	7.15	7.81	7.23	7.54	7.55	7.88	7.44
8:00p							8.61	8.50	8.37	8.06	8.12	8.64	8.72	7.96	7.76	7.97	8.50	8.75	8.61	8.02	7.73	7.77	7.34	7.26	7.86	7.27	7.58	7.57	7.84	7.59
9:00p							8.65	8.46	8.38	7.87	8.03	8.61	8.61	7.90	7.75	7.93	8.53	8.79	8.57	7.91	7.73	7.75	7.30	7.31	7.92	7.27	7.59	7.64	7.83	7.58
10:00p							8.67	8.47	8.32	7.78	7.80	8.48	8.52	7.89	7.68	7.88	8.44	8.79	8.55	7.90	7.72	7.72	7.34	7.37	7.96	7.28	7.62	7.65	7.80	7.54
11:00p							8.67	8.50	8.18	7.76	7.69	8.31	8.42	7.80	7.63	7.79	8.48	8.71	8.53	7.76	7.75	7.73	7.33	7.42	7.98	7.30	7.67	7.67	7.81	7.53
Max.							8.67	8.60	8.42	8.07	8.17	8.77	8.82	8.35	7.80	8.00	8.74	8.79	8.68	8.48	7.94	7.94	7.94	7.46	7.98	7.99	7.67	7.79	7.88	7.96
Min.							8.59	8.19	7.89	7.28	7.04	7.19	7.76	7.57	6.98	7.23	7.27	7.85	8.02	7.73	7.14	7.64	7.29	7.09	7.18	6.99	7.10	7.28	7.64	7.44
Avg.							8.62	8.41	8.13	7.62	7.54	7.96	8.31	7.86	7.44	7.63	7.87	8.26	8.36	8.01	7.59	7.79	7.60	7.27	7.52	7.37	7.34	7.57	7.76	7.79

Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
June 2000



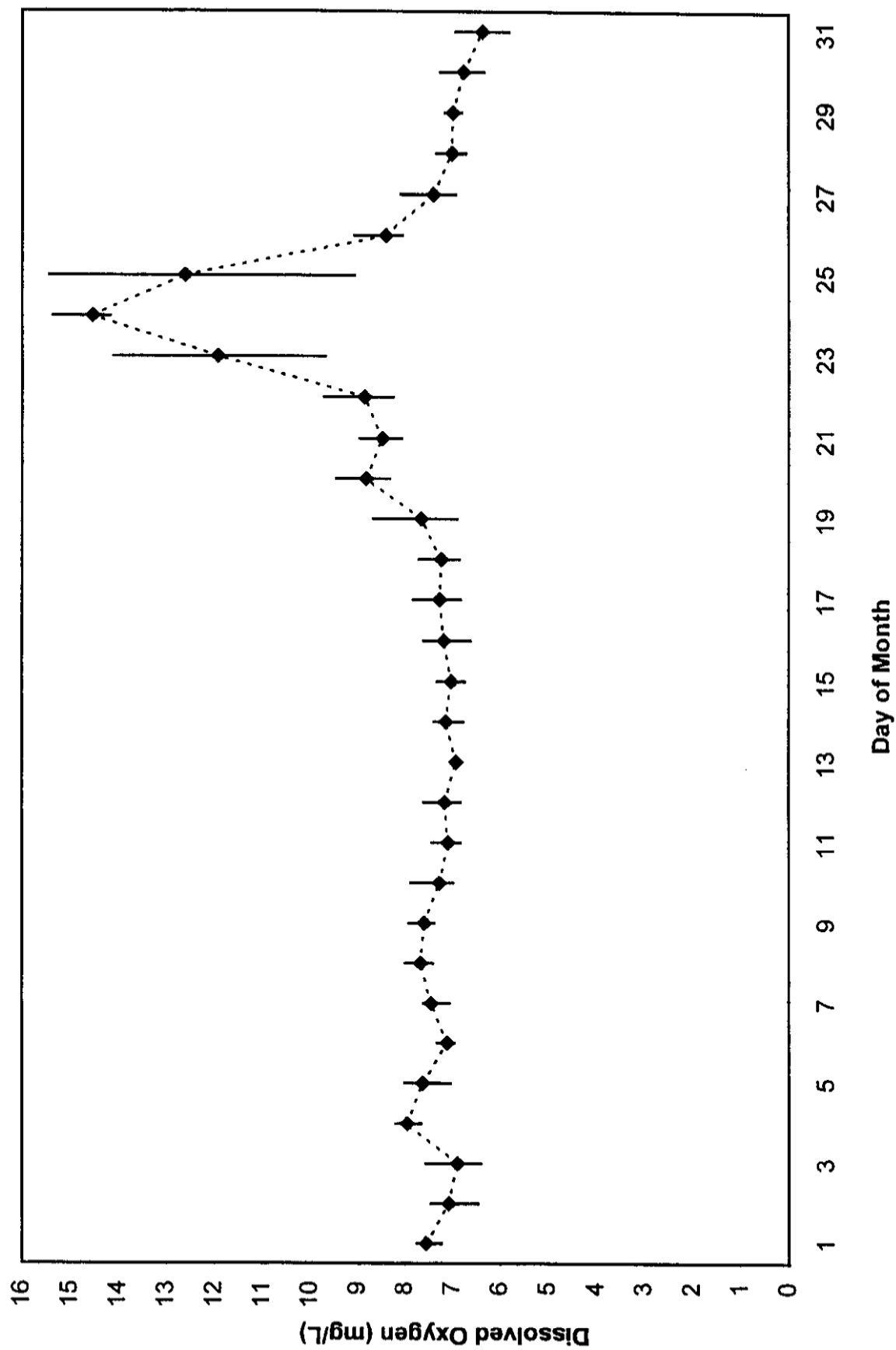
Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), July 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	7.54	7.20	6.42	7.66	7.79	7.10	7.06	7.63	7.53	7.88	7.42	7.43	6.86	6.98	6.77	6.62	6.97	7.01	7.28	8.78	8.96	8.63	9.74	14.20	15.33	9.08	8.10	7.12	6.96	7.23	6.93
1:00a	7.55	7.24	6.41	7.82	7.77	7.03	7.07	7.73	7.53	7.80	7.44	7.49	6.92	7.03	6.75	6.73	6.84	6.97	7.17	8.61	8.83	8.59	9.68	14.25	15.27	9.01	8.02	7.07	7.06	7.14	6.69
2:00a	7.55	7.26	6.41	7.87	7.80	6.96	7.13	7.81	7.51	7.73	7.41	7.55	6.97	7.11	6.77	6.83	6.84	6.92	7.09	8.56	8.69	8.59	9.79	14.25	15.17	8.93	7.91	7.34	7.13	7.10	6.68
3:00a	7.62	7.27	6.42	7.93	7.83	6.96	7.17	7.86	7.55	7.66	7.35	7.60	6.98	7.20	6.80	6.80	6.89	6.88	7.03	8.58	8.64	8.57	9.83	14.31	15.18	8.80	7.85	7.32	7.08	7.26	6.60
4:00a	7.62	7.26	6.41	8.01	7.88	7.00	7.35	7.99	7.57	7.57	7.29	7.60	7.01	7.27	6.78	6.85	6.95	6.87	6.96	8.51	8.58	8.53	9.88	14.25	15.19	8.67	7.75	7.02	7.08	7.18	6.92
5:00a	7.66	7.28	6.46	8.06	7.94	6.97	7.43	8.00	7.54	7.45	7.23	7.57	7.02	7.30	6.84	6.86	6.89	6.87	6.92	8.42	8.63	8.44	9.89	14.23	15.17	8.63	7.68	7.12	7.07	7.20	6.70
6:00a	7.66	7.32	6.47	8.11	7.97	6.99	7.50	7.99	7.54	7.29	7.15	7.49	7.00	7.31	6.92	6.95	6.83	6.86	6.90	8.36	8.34	8.37	10.12	14.22	15.13	8.51	7.63	7.16	7.04	7.05	6.58
7:00a	7.67	7.36	6.50	8.14	8.01	7.04	7.52	7.96	7.53	7.17	7.08	7.42	6.95	7.30	6.94	6.99	6.92	6.85	6.93	8.33	8.25	8.29	10.11	14.21	15.01	8.44	7.55	7.11	7.01	7.07	6.67
8:00a	7.67	7.42	6.55	8.16	8.01	7.13	7.55	7.92	7.46	7.07	6.98	7.34	6.95	7.32	7.07	7.07	7.00	6.91	6.94	8.32	8.19	8.26	10.15	14.16	15.03	8.33	7.50	7.02	6.94	6.90	6.71
9:00a	7.68	7.45	6.68	8.18	8.01	7.17	7.56	7.87	7.39	7.00	6.93	7.25	6.92	7.35	7.13	7.21	7.15	6.91	7.02	8.37	8.11	8.25	10.15	14.20	14.88	8.26	7.46	6.97	6.92	6.86	6.61
10:00a	7.73	7.44	6.76	8.20	7.97	7.25	7.57	7.81	7.41	6.98	6.88	7.20	6.94	7.39	7.20	7.40	7.32	7.01	7.10	8.50	8.11	8.54	10.91	14.28	15.44	8.18	7.46	6.92	6.89	6.73	6.65
11:00a	7.74	7.41	6.83	8.20	7.93	7.28	7.62	7.70	7.40	7.02	6.87	7.11	*	7.37	7.17	7.53	7.45	7.11	7.26	8.70	8.07	8.62	13.19	14.34	14.92	8.12	7.12	6.84	6.80	6.72	6.72
12:00p	7.75	7.34	6.88	8.04	7.87	7.33	7.58	7.59	7.41	7.03	6.91	7.05	7.00	7.33	7.19	7.62	7.63	7.21	7.42	8.85	8.15	8.72	13.21	14.34	14.87	8.05	7.23	6.83	6.89	6.64	6.20
1:00p	7.69	7.27	6.99	7.95	7.80	7.31	7.58	7.51	7.46	7.03	6.87	6.97	6.99	7.31	7.19	7.57	7.74	7.32	7.64	8.92	8.17	8.76	13.29	14.38	14.90	8.07	7.39	6.72	6.90	6.67	6.32
2:00p	7.70	7.18	7.12	7.94	7.69	7.27	7.56	7.43	7.52	7.05	6.94	7.02	6.91	7.23	7.33	7.30	7.78	7.48	7.84	9.04	8.27	8.86	13.56	14.44	9.09	8.11	7.22	7.04	6.82	6.45	6.20
3:00p	7.57	7.05	7.06	7.94	7.58	7.18	7.49	7.41	7.61	7.03	6.83	6.93	6.88	7.21	7.30	7.21	7.83	7.56	8.05	9.45	8.38	8.93	13.58	14.50	9.14	8.13	7.30	6.89	6.89	6.46	6.31
4:00p	7.57	6.91	7.29	7.91	7.40	7.18	7.50	7.43	7.65	7.07	6.88	6.96	6.91	7.11	7.08	7.61	7.79	7.65	7.90	9.26	8.48	9.06	13.64	14.60	9.07	8.21	7.24	6.89	6.97	6.62	6.04
5:00p	7.48	6.76	7.25	7.90	7.30	7.11	7.51	7.48	7.72	7.12	6.91	6.91	6.84	7.05	7.29	7.46	7.71	7.69	8.65	9.27	8.55	9.17	13.81	14.74	9.12	8.24	7.10	6.99	6.97	6.59	6.10
6:00p	7.43	6.67	7.56	7.85	7.24	7.08	7.49	7.48	7.75	7.15	6.93	6.87	6.83	6.94	7.30	7.49	7.68	7.70	8.58	9.25	8.60	9.38	13.87	14.81	9.14	8.32	7.05	7.05	6.97	6.35	6.06
7:00p	7.51	6.62	7.36	7.98	7.17	7.06	7.48	7.47	7.79	7.21	7.08	6.87	6.83	6.95	7.28	7.43	7.50	7.70	8.68	9.28	8.61	9.48	13.92	15.10	9.14	8.33	7.15	7.06	7.05	6.49	5.85
8:00p	7.33	6.61	7.31	7.92	7.06	7.02	7.49	7.50	7.84	7.27	7.14	6.83	6.92	6.94	7.03	7.35	7.33	7.71	8.66	9.22	8.64	9.57	14.01	15.25	9.18	8.42	7.12	7.02	7.10	6.33	5.83
9:00p	7.30	6.60	7.38	7.72	7.04	7.09	7.50	7.50	7.87	7.30	7.20	6.83	6.93	6.87	6.97	7.34	7.28	7.62	8.62	9.14	8.87	9.67	14.01	15.23	9.14	8.44	7.02	6.91	7.04	6.36	5.81
10:00p	7.23	6.53	7.57	7.71	7.07	7.03	7.52	7.52	7.89	7.35	7.25	6.84	6.88	6.82	6.91	7.19	7.14	7.49	8.64	9.12	8.68	9.71	14.10	15.19	9.13	8.36	7.02	6.91	7.16	6.50	5.84
11:00p	7.26	6.46	7.55	7.79	7.11	7.12	7.58	7.54	7.92	7.39	7.34	6.86	6.89	6.77	6.74	7.01	7.05	7.39	8.56	9.00	8.68	9.70	**	15.37	9.08	8.20	6.93	6.96	7.03	6.50	5.93
Max.	7.75	7.45	7.57	8.20	8.01	7.33	7.62	8.00	7.92	7.88	7.44	7.60	7.02	7.39	7.33	7.62	7.83	7.71	8.68	9.45	8.96	9.71	14.10	15.37	15.44	9.08	8.10	7.34	7.16	7.26	6.93
Min.	7.23	6.46	6.41	7.66	7.04	6.96	7.06	7.41	7.39	6.98	6.83	6.83	6.83	6.77	6.74	6.62	6.83	6.85	6.90	8.32	8.07	8.25	9.68	14.16	9.07	8.05	6.93	6.72	6.80	6.33	5.81
Avg.	7.56	7.08	6.90	7.96	7.64	7.11	7.45	7.67	7.60	7.28	7.10	7.17	6.93	7.14	7.03	7.18	7.27	7.24	7.66	8.83	8.48	8.86	11.93	14.54	12.61	8.41	7.41	7.01	6.99	6.77	6.37

* Indicates a missing reading due to servicing. ** Bad reading (9999)

Starting around July 19, unit began to show problems with increasing DO roughly following a service (new batteries). After servicing, unit performed better. Replaced 7/27 (1100) with standard membrane datasonde

Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
July 2000

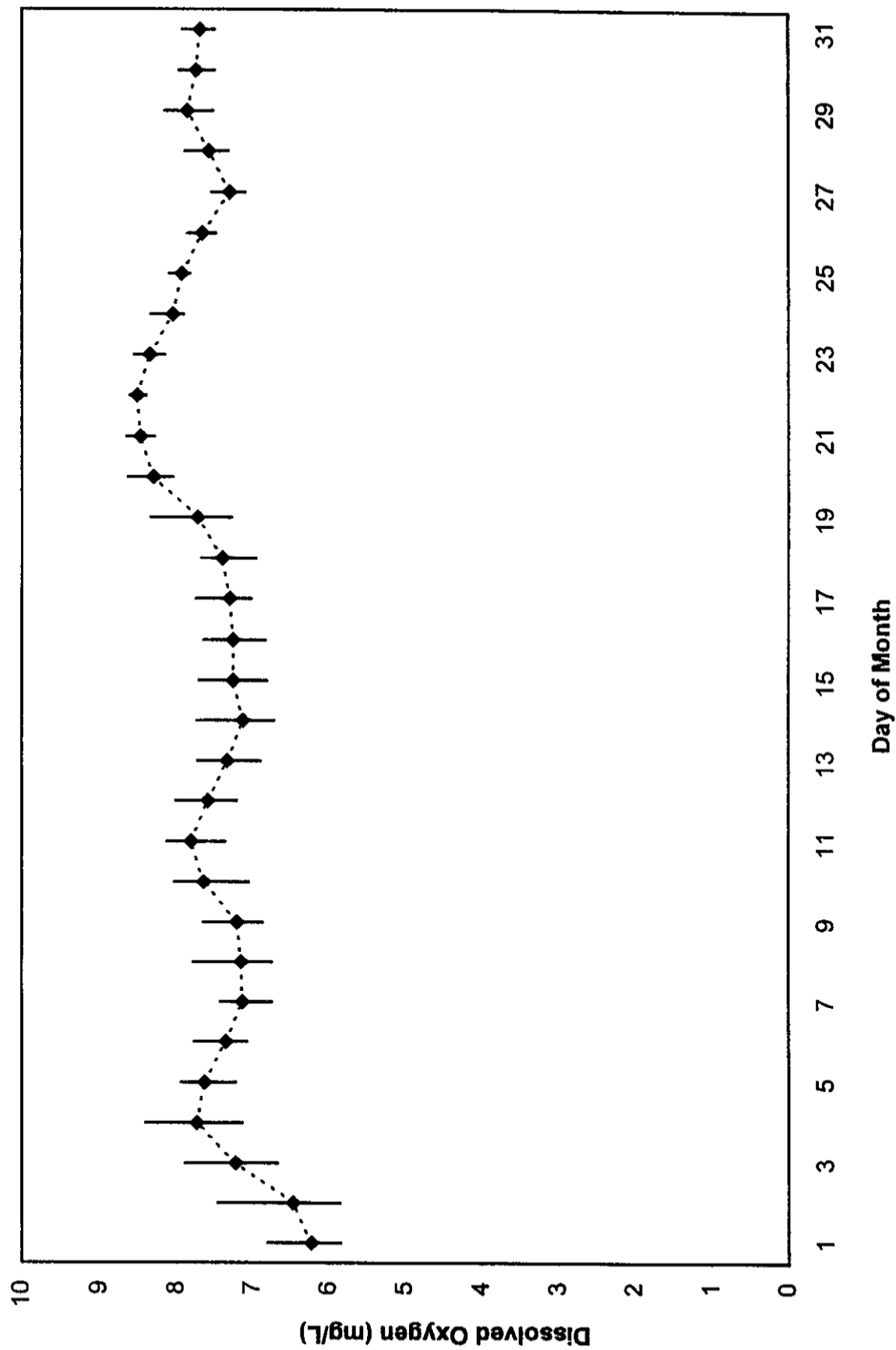


Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), August 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	5.90	6.12	6.78	7.55	7.89	7.77	7.42	7.18	7.38	7.05	7.63	7.32	7.14	7.27	7.23	7.37	7.39	7.67	7.52	8.32	8.56	8.56	8.54	8.34	8.04	7.86	7.54	7.49	7.82	7.95	7.76
1:00a	6.33	6.11	6.71	7.43	7.82	7.73	7.31	7.15	7.28	7.16	7.69	7.28	7.09	7.13	7.30	7.25	7.33	7.65	7.50	8.33	8.56	8.60	8.55	8.26	8.08	7.85	7.52	7.45	7.82	7.86	7.71
2:00a	5.85	6.05	6.68	7.36	7.79	7.59	7.22	7.08	7.21	7.24	7.72	7.29	7.06	7.08	7.19	7.18	7.32	7.57	7.49	8.34	8.65	8.55	8.51	8.25	8.10	7.75	7.51	7.43	7.81	7.81	7.64
3:00a	6.01	6.11	6.69	7.20	7.64	7.50	7.14	6.96	7.08	7.32	7.79	7.37	7.14	7.00	7.06	7.11	7.23	7.52	7.44	8.35	8.61	8.56	8.47	8.21	8.05	7.73	7.42	7.48	7.77	7.75	7.64
4:00a	6.10	6.00	6.70	7.14	7.52	7.42	7.04	6.92	7.03	7.40	7.82	7.37	7.11	6.94	7.03	7.03	7.11	7.44	7.42	8.28	8.57	8.55	8.49	8.19	8.02	7.71	7.35	7.47	7.76	7.71	7.61
5:00a	6.00	6.00	6.70	7.14	7.43	7.33	6.95	6.87	6.95	7.46	7.83	7.39	7.08	6.84	6.94	6.94	7.04	7.33	7.35	8.20	8.53	8.50	8.47	8.16	8.02	7.72	7.23	7.41	7.70	7.64	7.58
6:00a	5.89	6.03	6.73	7.14	7.32	7.23	6.85	6.85	6.92	7.50	7.84	7.21	7.02	6.77	6.87	6.94	7.07	7.23	7.30	8.13	8.48	8.49	8.41	8.05	8.03	7.70	7.16	7.40	7.64	7.62	7.58
7:00a	5.97	6.05	6.73	7.17	7.23	7.13	6.79	6.81	6.87	7.45	7.89	7.23	6.89	6.77	6.82	6.83	7.02	7.10	7.28	8.08	8.38	8.44	8.34	8.01	8.02	7.64	7.12	7.32	7.59	7.56	7.51
8:00a	6.18	5.86	6.77	7.18	7.24	7.14	6.75	6.77	6.88	7.55	7.94	7.31	6.96	6.73	6.81	6.83	7.13	7.01	7.28	8.05	8.34	8.41	8.27	7.93	8.01	7.58	7.11	7.46	7.52	7.52	7.50
9:00a	6.28	6.03	6.82	7.21	7.29	7.11	6.75	6.75	6.94	7.63	8.00	7.47	6.99	6.72	6.83	6.85	7.07	6.96	7.33	8.05	8.32	8.41	8.26	7.94	7.97	7.57	7.10	7.44	7.59	7.50	7.52
10:00a	6.34	6.08	6.94	7.34	7.37	7.09	6.87	6.77	6.96	7.85	8.07	7.62	7.22	6.77	6.85	6.91	7.07	6.98	7.37	8.05	8.29	8.40	8.25	7.91	7.93	7.71	7.11	7.44	7.61	7.50	7.51
11:00a	6.42	6.15	7.13	7.64	7.41	7.08	6.95	6.83	7.03	7.94	8.12	7.79	7.35	6.83	6.96	7.01	7.08	7.06	7.43	8.10	8.30	8.40	8.25	7.95	7.88	7.71	7.18	7.34	7.70	7.55	7.56
12:00p	6.32	6.25	7.37	7.82	7.42	7.08	6.98	7.01	7.13	*	8.10	7.94	7.22	6.97	7.12	7.15	7.11	7.19	7.49	8.12	8.32	8.42	8.25	7.93	7.84	7.80	7.20	7.38	7.80	7.59	7.59
1:00p	6.47	6.40	7.48	8.02	7.54	7.10	7.08	7.12	7.24	8.02	8.11	8.01	7.36	7.06	7.45	7.32	7.16	7.27	7.60	8.20	8.37	8.48	8.18	7.99	7.92	7.77	7.22	7.50	7.90	7.62	7.69
2:00p	6.80	6.63	7.54	8.21	7.59	7.14	7.18	7.14	7.35	8.01	8.08	7.86	7.53	7.19	7.37	7.41	7.19	7.39	7.76	8.24	8.33	8.50	8.16	7.98	7.88	7.60	7.25	7.56	7.99	7.69	7.78
3:00p	6.59	6.68	7.60	8.25	7.70	7.20	7.26	7.23	7.48	7.97	8.03	7.89	7.60	7.26	7.47	7.36	7.25	7.38	7.92	8.28	8.40	8.46	8.17	7.96	7.85	7.58	7.29	7.66	8.04	*	7.87
4:00p	6.43	6.62	7.67	8.33	7.82	7.30	7.38	7.38	7.61	7.95	7.89	7.88	7.65	7.29	7.60	7.53	7.34	7.51	8.06	8.35	8.44	8.53	8.23	8.01	7.87	7.54	7.26	7.73	8.07	7.86	7.92
5:00p	6.17	7.44	7.67	8.40	7.86	7.47	7.42	7.50	7.63	7.88	7.78	7.77	7.68	7.32	7.64	7.64	7.41	7.54	8.17	8.40	8.47	8.57	8.26	7.96	7.85	7.49	7.32	7.80	8.11	7.91	7.84
6:00p	6.15	7.46	7.73	8.40	7.87	7.51	7.29	7.52	7.64	7.83	7.69	7.86	7.71	7.44	7.66	7.60	7.52	7.64	8.20	8.46	8.50	8.55	8.35	7.97	7.87	7.56	7.43	7.86	8.15	7.96	7.77
7:00p	6.50	7.35	7.89	8.40	7.91	7.53	7.31	7.58	7.56	7.84	7.58	7.88	7.69	7.73	7.69	7.64	7.59	7.67	8.23	8.52	8.56	8.57	8.38	8.02	7.88	7.60	7.37	7.89	8.15	7.97	7.83
8:00p	6.34	7.20	7.88	8.37	7.94	7.55	7.34	7.78	7.36	7.76	7.55	7.87	7.70	7.55	7.70	7.60	7.63	7.65	8.33	8.57	8.56	8.61	8.42	8.08	7.86	7.65	7.38	7.85	8.11	7.96	7.77
9:00p	6.32	7.05	7.86	8.03	7.93	7.50	7.36	7.62	7.19	7.66	7.46	7.65	7.72	7.51	7.61	7.60	7.72	7.66	8.30	8.56	8.57	8.61	8.40	8.07	7.89	7.64	7.37	7.85	8.04	7.95	7.81
10:00p	6.21	6.92	7.85	8.00	7.86	7.51	7.36	7.47	7.09	7.61	7.41	7.54	7.68	7.48	7.50	7.58	7.74	7.58	8.30	8.63	8.58	8.60	8.40	8.04	7.84	7.60	7.45	7.78	7.97	7.88	7.81
11:00p	5.97	6.83	7.56	7.90	7.82	7.44	7.26	7.39	7.08	7.62	7.36	7.26	7.45	7.44	7.44	7.50	7.68	7.57	8.29	8.56	8.56	8.57	8.37	8.10	7.83	7.59	7.46	7.83	7.97	7.78	7.84

* Service point (missing data)

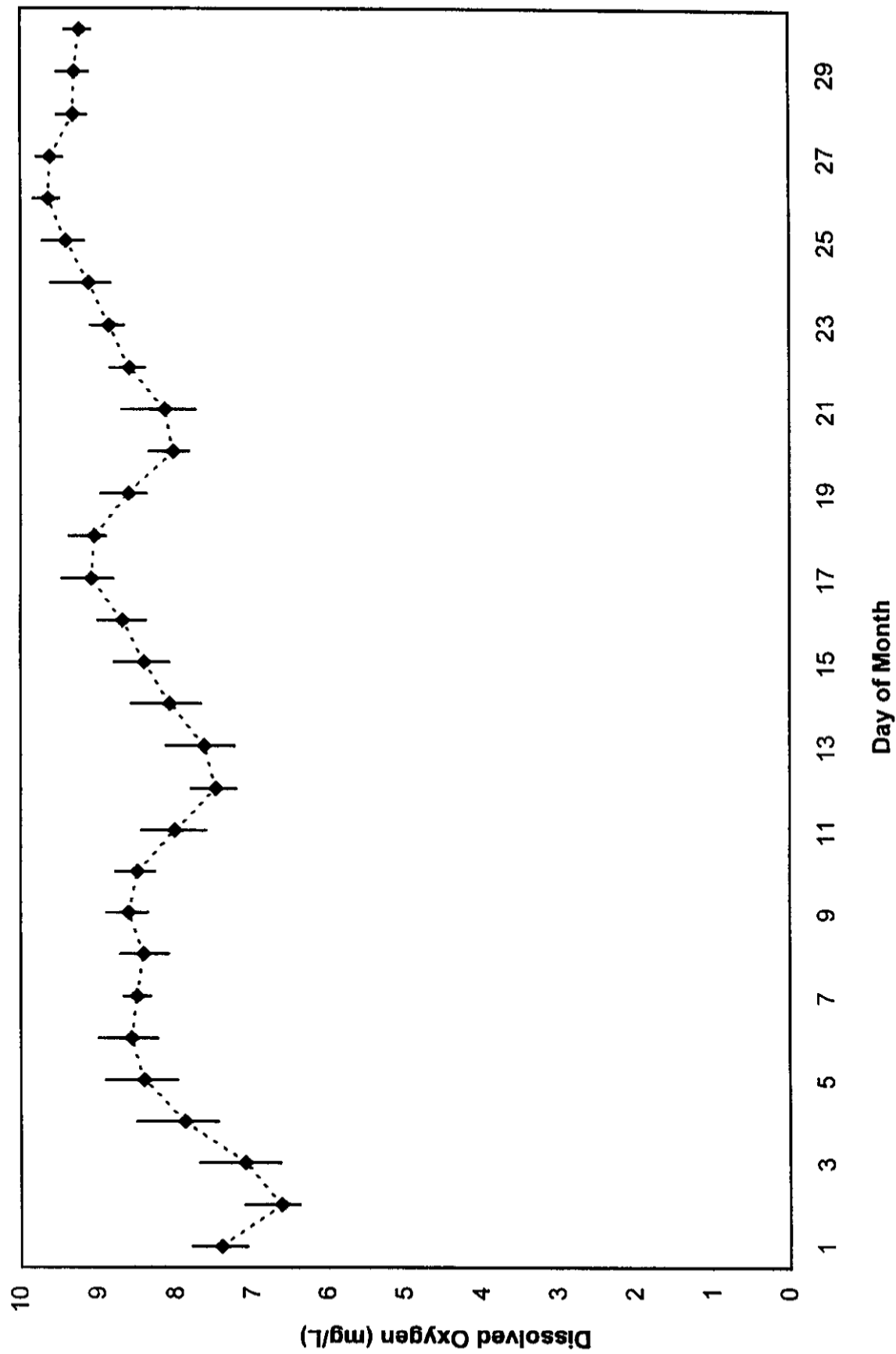
Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
August 2000



Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), September 2000

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	7.79	7.10	6.64	7.64	8.08	8.54	8.64	8.59	8.63	8.77	8.41	7.53	7.56	8.02	8.38	8.67	8.99	9.38	8.96	8.34	7.85	8.56	8.85	8.90	9.36	9.65	9.70	9.53	9.22	9.43
1:00a	7.68	7.05	6.70	7.60	8.08	8.59	8.66	8.55	8.62	8.72	8.44	7.40	7.54	7.97	8.34	8.63	8.97	9.25	8.89	8.31	7.85	8.53	8.83	8.91	9.34	9.62	9.69	9.52	9.19	9.40
2:00a	7.61	6.97	6.69	7.50	8.04	8.47	8.57	8.48	8.65	8.70	8.39	7.39	7.48	7.97	8.31	8.58	8.91	9.14	8.83	8.27	7.83	8.55	8.83	8.88	9.36	9.60	9.66	9.45	9.20	9.37
3:00a	7.60	6.87	6.71	7.46	7.99	8.39	8.48	8.43	8.62	8.64	8.28	7.34	7.39	8.01	8.29	8.55	8.86	9.10	8.81	8.24	7.83	8.52	8.81	8.89	9.32	9.60	9.66	9.44	9.19	9.35
4:00a	7.56	6.75	6.73	7.48	8.01	8.33	8.44	8.41	8.58	8.57	8.19	7.33	7.34	7.92	8.27	8.51	8.87	9.07	8.76	8.20	7.81	8.49	8.79	8.89	9.28	9.62	9.62	9.43	9.24	9.29
5:00a	7.51	6.67	6.76	7.50	8.04	8.32	8.46	8.34	8.52	8.47	8.17	7.30	7.29	7.87	8.23	8.51	8.85	9.03	8.73	8.17	7.83	8.46	8.74	8.84	9.23	9.60	9.58	9.43	9.21	9.29
6:00a	7.50	6.63	6.81	7.50	8.00	8.31	8.42	8.28	8.48	8.36	8.19	7.28	7.31	7.83	8.18	8.42	8.83	8.99	8.63	8.10	7.83	8.47	8.70	8.91	9.21	9.58	9.55	9.38	9.18	9.26
7:00a	7.45	6.57	6.70	7.49	8.03	8.27	8.35	8.23	8.39	8.34	8.09	7.25	7.26	7.68	8.13	8.39	8.81	8.98	8.57	7.97	7.82	8.43	8.71	8.89	9.20	9.54	9.55	9.37	9.19	9.19
8:00a	7.45	6.51	6.72	7.48	8.04	8.24	8.33	8.17	8.36	8.29	8.00	7.22	7.27	7.68	8.11	8.40	8.82	8.93	8.64	7.93	7.75	8.42	8.68	8.85	9.20	9.53	9.62	9.33	9.14	9.18
9:00a	7.44	6.46	6.74	7.50	8.12	8.27	8.35	8.11	8.36	8.29	7.92	7.24	7.24	7.71	8.09	8.40	8.83	8.92	8.55	7.91	7.79	8.40	8.67	8.85	9.18	9.51	9.59	9.30	9.12	9.16
10:00a	7.41	6.40	6.80	7.58	8.25	8.31	8.34	8.10	8.37	8.27	7.91	7.26	7.27	7.75	8.12	8.41	8.85	8.90	8.55	7.95	7.86	8.45	8.68	8.89	9.20	9.50	9.56	9.23	9.13	9.14
11:00a	7.41	6.39	6.84	7.67	8.36	8.38	8.39	8.18	8.37	8.30	8.00	7.32	7.36	7.77	8.17	8.49	8.92	8.90	8.55	7.92	7.90	8.47	8.72	8.94	9.26	9.50	9.46	9.19	9.19	9.09
12:00p	7.41	6.39	6.95	7.82	8.46	8.50	8.41	8.17	8.41	8.33	8.00	7.39	7.49	7.84	8.25	8.57	9.00	8.95	8.57	7.91	7.98	8.53	8.77	9.01	9.29	9.58	9.46	9.15	9.25	9.14
1:00p	7.41	6.40	7.13	7.94	8.51	8.59	8.43	8.22	8.48	8.41	7.98	7.45	7.58	7.89	8.37	8.69	9.08	9.03	8.59	7.95	8.09	8.56	8.87	9.12	9.35	9.62	9.48	9.18	9.33	9.18
2:00p	7.39	6.43	7.30	8.06	8.61	8.67	8.41	8.25	8.56	8.41	7.99	7.47	7.66	8.02	8.42	8.79	9.18	9.10	8.60	7.96	8.24	8.60	8.90	9.19	9.43	9.70	9.57	9.25	9.33	9.23
3:00p	7.39	6.50	7.39	8.24	8.72	8.72	8.44	8.34	8.64	8.46	7.90	7.55	7.74	8.30	8.50	8.82	9.25	9.19	8.52	8.00	8.37	8.66	8.99	9.28	9.46	9.73	9.65	9.26	9.39	9.27
4:00p	7.36	6.53	7.55	8.26	8.87	8.82	8.50	8.39	8.75	8.61	7.86	7.70	7.83	8.32	8.60	8.84	9.32	9.15	8.54	8.07	8.48	8.66	9.06	9.39	9.54	9.82	9.77	9.28	9.46	9.31
5:00p	7.35	6.59	7.59	8.39	8.90	8.83	8.58	8.63	8.79	8.60	7.91	7.76	8.04	8.41	8.71	8.91	9.35	9.10	8.48	8.08	8.52	8.70	9.09	9.44	9.65	9.83	9.79	9.30	9.47	9.27
6:00p	7.31	6.63	7.58	8.50	8.89	8.97	8.61	8.65	8.81	8.66	7.85	7.78	8.12	8.56	8.75	8.95	9.41	9.06	8.50	8.05	8.59	8.73	9.10	9.58	9.70	9.84	9.74	9.28	9.49	9.28
7:00p	7.28	6.66	7.56	8.42	8.88	8.99	8.66	8.69	8.83	8.68	7.84	7.80	8.02	8.57	8.78	9.00	9.42	9.06	8.51	8.00	8.64	8.80	9.04	9.61	9.72	9.80	9.69	9.31	9.53	9.26
8:00p	7.20	6.67	7.62	8.38	8.86	8.89	8.67	8.71	8.89	8.51	7.79	7.74	8.05	8.51	8.79	9.00	9.39	9.02	8.46	7.94	8.69	8.81	8.97	9.43	9.69	9.71	9.65	9.38	9.50	9.22
9:00p	7.14	6.61	7.69	8.29	8.74	8.85	8.66	8.68	8.86	8.49	7.79	7.70	8.11	8.45	8.71	9.00	9.37	8.95	8.46	7.91	8.65	8.82	8.94	9.42	9.68	9.67	9.63	9.34	9.50	9.18
10:00p	7.10	6.61	7.58	8.23	8.70	8.76	8.59	8.66	8.82	8.47	7.74	7.68	8.11	8.44	8.68	8.99	9.36	8.97	8.43	7.83	8.62	8.84	8.92	9.39	9.71	9.66	9.61	9.25	9.50	9.14
11:00p	7.08	6.61	7.64	8.26	8.64	8.68	8.62	8.69	8.77	8.51	7.61	7.63	8.08	8.45	8.66	8.94	9.47	8.95	8.38	7.83	8.55	8.84	8.89	9.39	9.66	9.71	9.59	9.26	9.46	9.12
Max.	7.79	7.10	7.69	8.50	8.90	8.99	8.67	8.71	8.89	8.77	8.44	7.80	8.12	8.57	8.79	9.00	9.47	9.38	8.96	8.34	8.69	8.84	9.10	9.61	9.72	9.84	9.79	9.53	9.53	9.43
Min.	7.08	6.39	6.64	7.46	7.99	8.24	8.33	8.10	8.36	8.27	7.61	7.22	7.24	7.68	8.09	8.39	8.81	8.90	8.38	7.83	7.75	8.40	8.67	8.84	9.18	9.50	9.46	9.15	9.12	9.09
Avg.	7.41	6.63	7.10	7.88	8.41	8.57	8.50	8.41	8.61	8.49	8.01	7.48	7.63	8.08	8.41	8.69	9.09	9.05	8.60	8.04	8.14	8.60	8.86	9.12	9.42	9.65	9.62	9.33	9.31	9.24

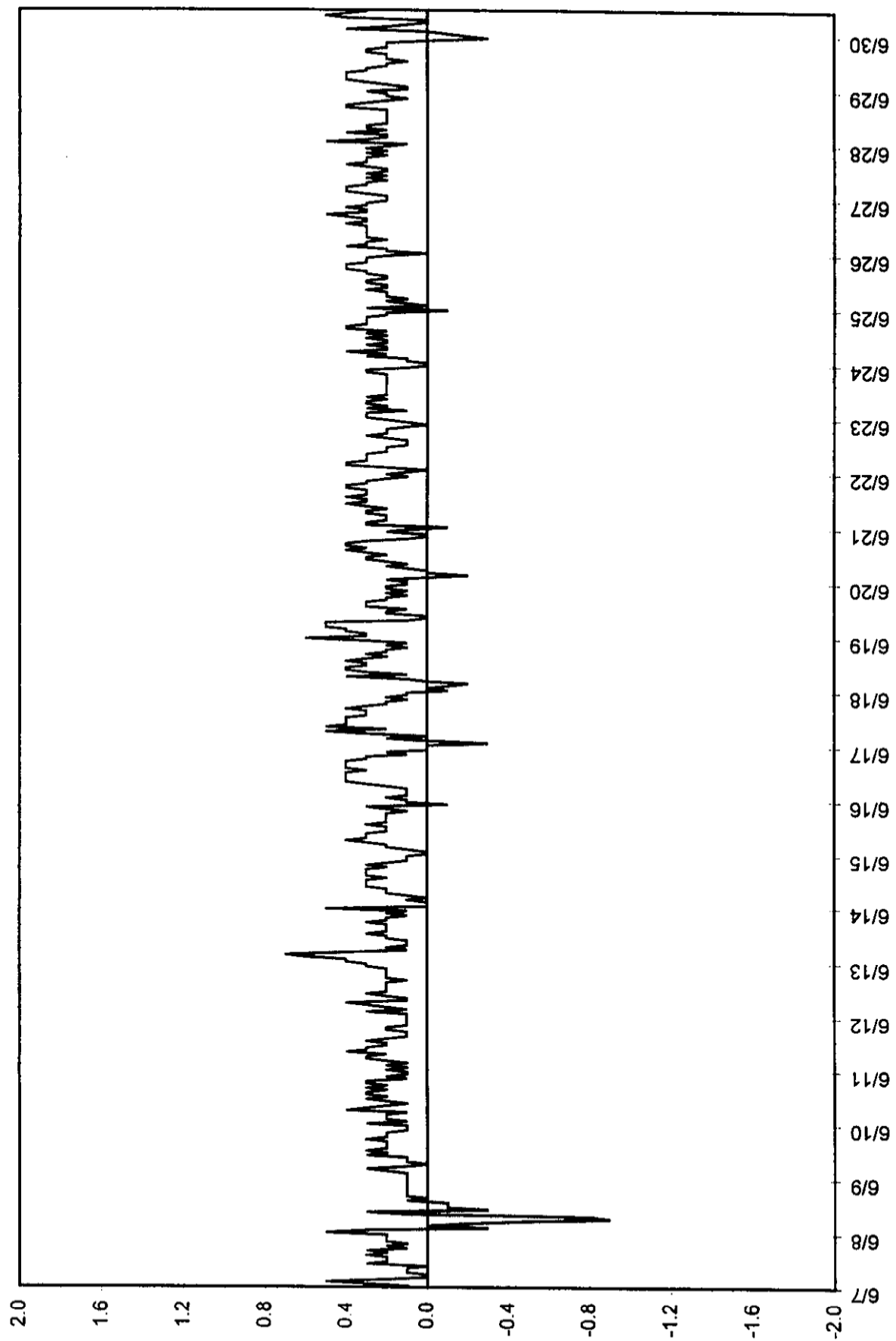
Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
September 2000



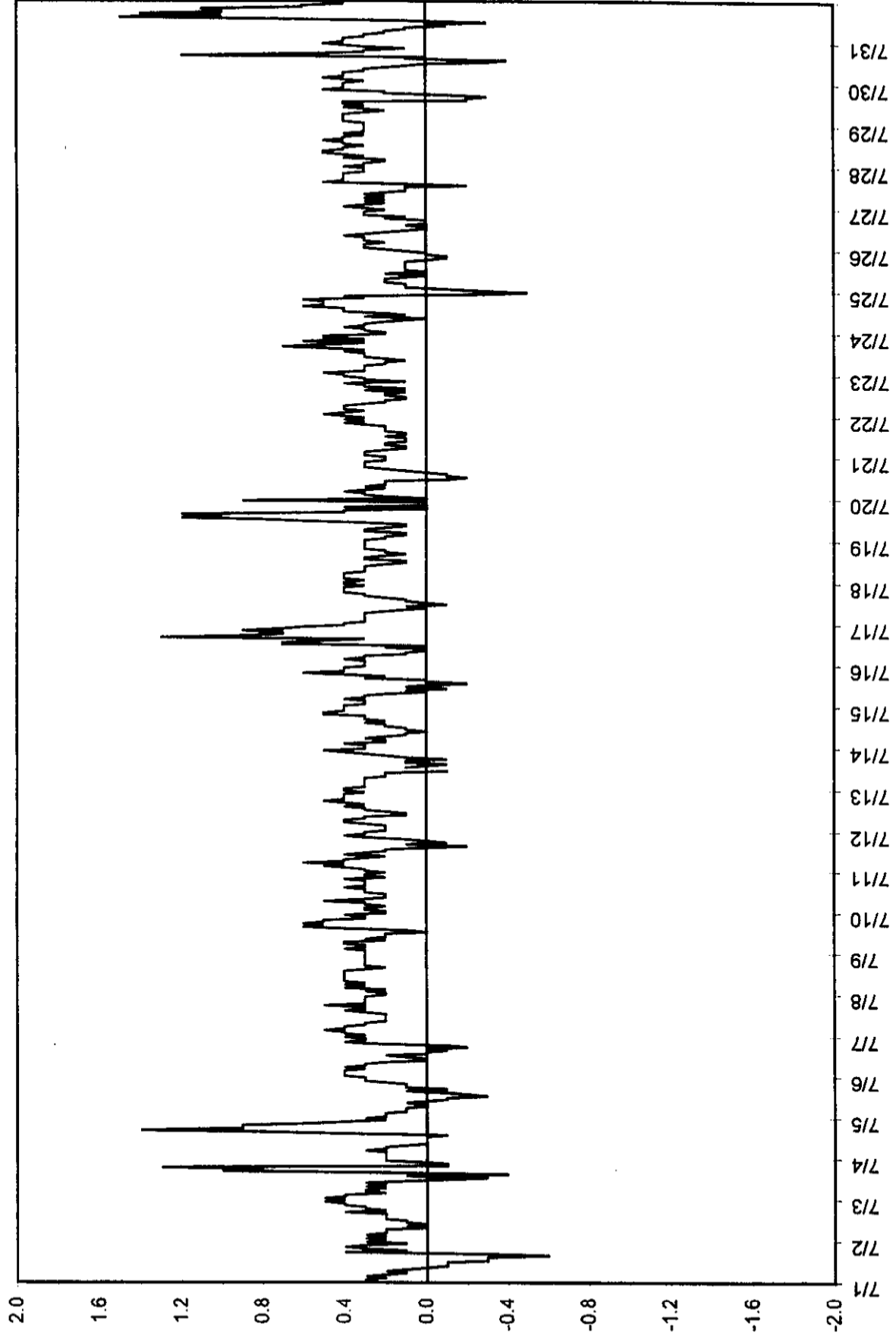
APPENDIX G

Comparison Between Hourly Temperatures at Sites

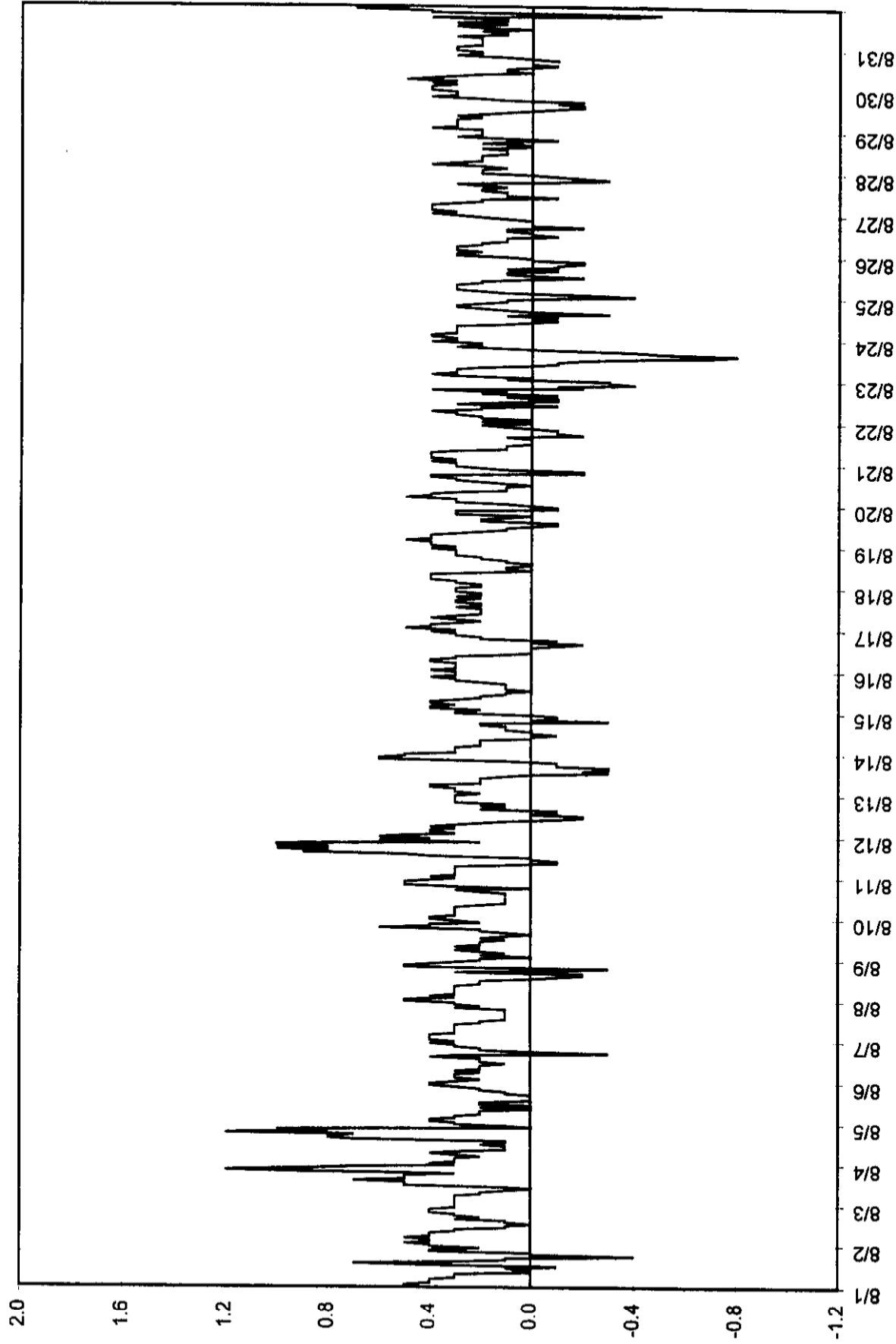
Raw Delta Temperature Calculations, Crystal Falls Hydroelectric Project (Downstream Minus Upstream)
June 2000



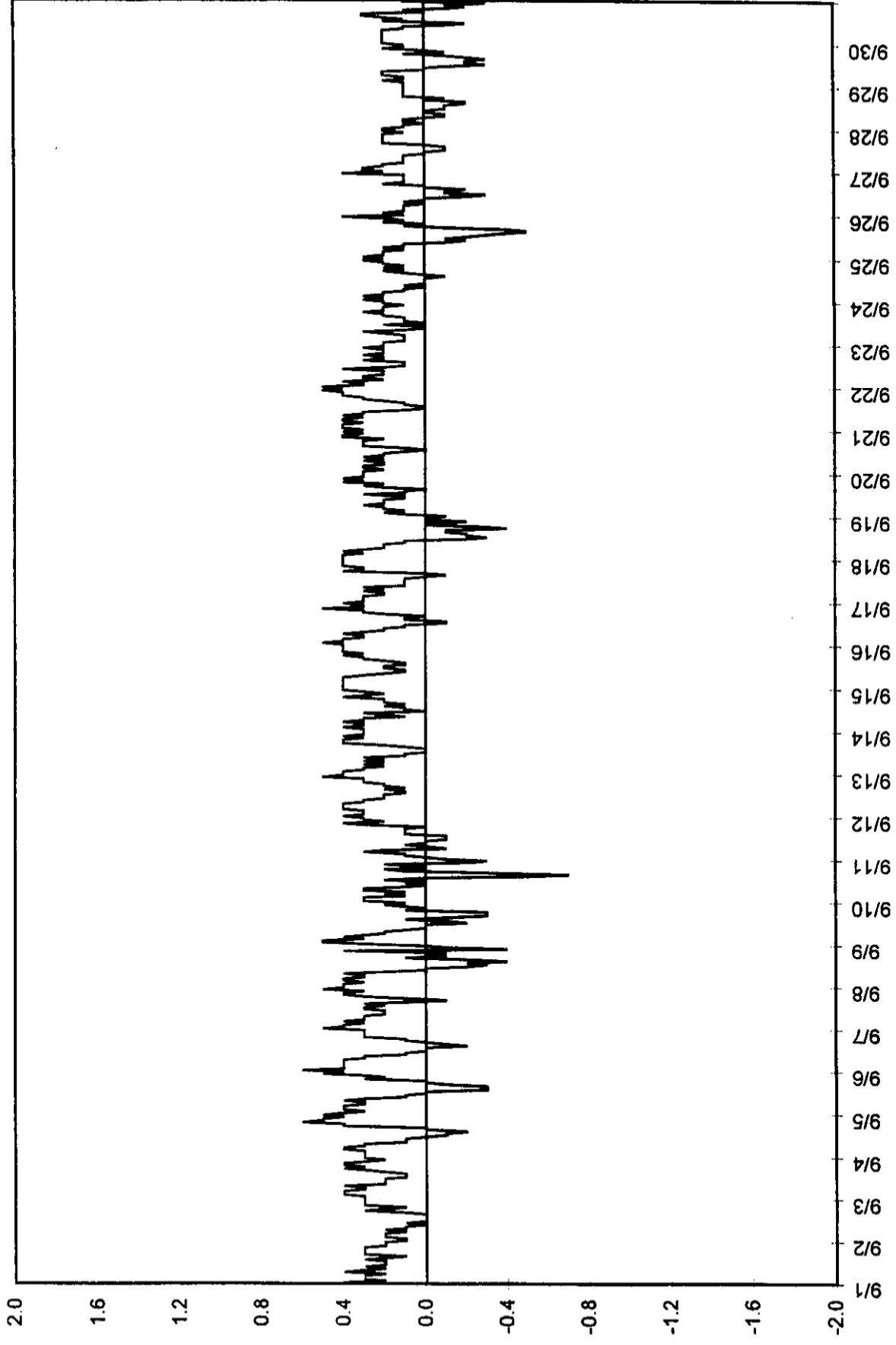
Raw Delta Temperature Calculations, Crystal Falls Hydroelectric Project (Downstream Minus Upstream)
July 2000



Raw Delta Temperature Calculations, Crystal Falls Hydroelectric Project (Downstream Minus Upstream)
August 2000



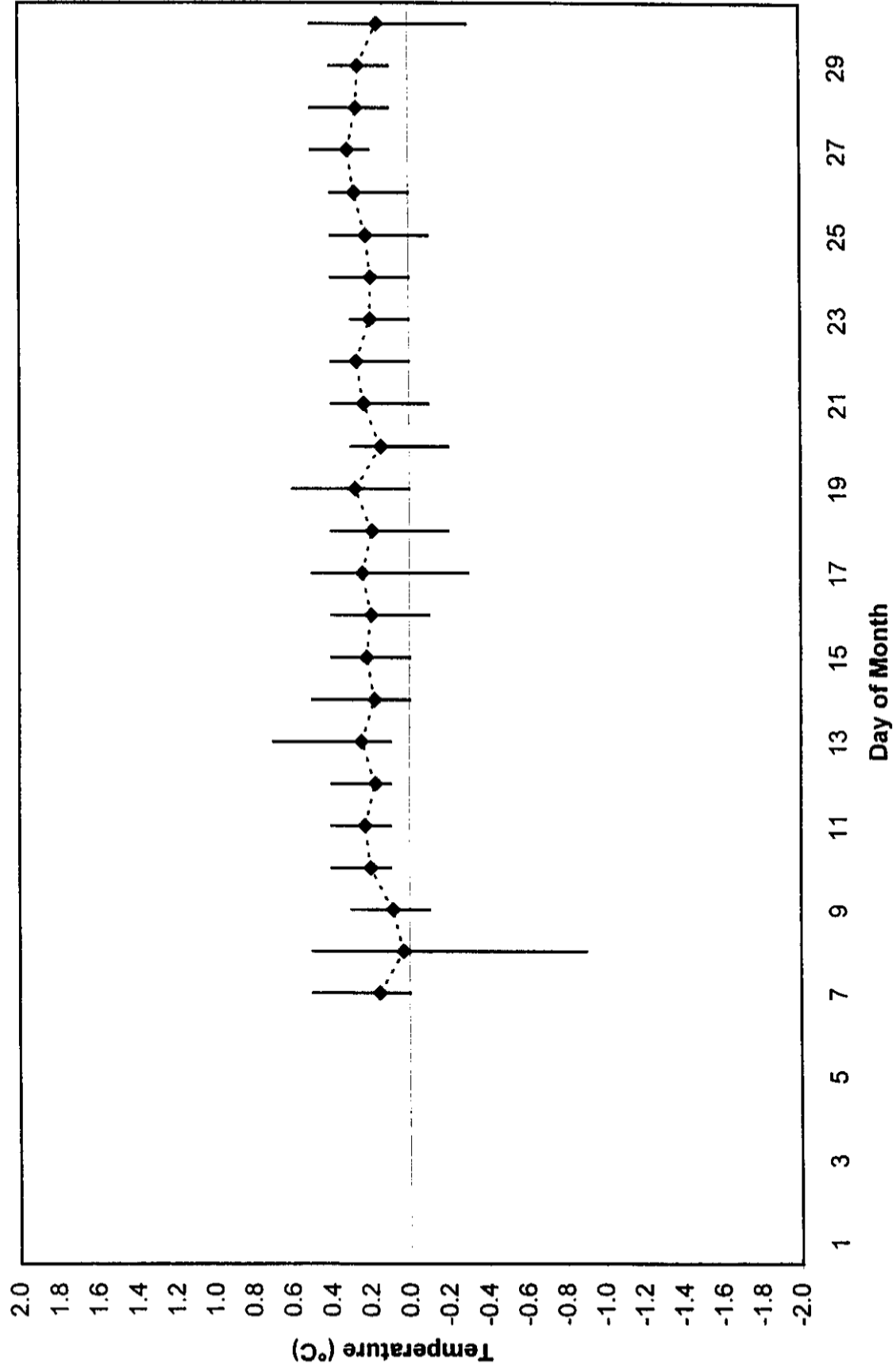
Raw Delta Temperature Calculations, Crystal Falls Hydroelectric Project (Downstream Minus Upstream)
September 2000



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), June 2000

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12:00a								0.2	-0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.4	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2
1:00a								0.2	-0.1	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.4	0.4	0.3	0.1	0.2	0.3	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1
2:00a								0.2	-0.1	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.1	0.2	0.3	0.2	0.4	0.2	0.2	0.2	0.2
3:00a								0.3	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.4	0.3	0.3	0.3	0.4	0.3	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2
4:00a								0.2	0.0	0.2	0.2	0.1	0.2	0.2	0.3	0.2	0.4	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.4	0.3	0.3	0.4	0.2	0.2
5:00a								0.3	0.1	0.2	0.3	0.1	0.1	0.2	0.3	0.2	0.4	0.4	0.3	0.2	0.4	0.3	0.3	0.2	0.2	0.4	0.3	0.4	0.3	0.4	0.3
6:00a								0.1	0.1	0.3	0.2	0.1	0.2	0.3	0.3	0.2	0.4	0.3	0.2	0.2	0.4	0.4	0.2	0.2	0.2	0.3	0.4	0.5	0.3	0.4	0.3
7:00a								0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.3	0.4	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.2
8:00a								0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.1	0.3	0.2	0.1	0.2	0.1	0.3	0.2	0.2	0.2	0.3	0.4	0.3	0.2	0.2	0.2
9:00a								0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.0	0.3	0.1	0.3	0.3	0.3	0.3	0.4	0.3	0.1	0.2
10:00a								0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.3	0.2	0.2	0.1	0.2	0.0	0.2	0.0	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.0
11:00a								0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-0.1	0.0	0.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.2	-0.3
12:00p								0.2	0.1	0.1	0.1	0.1	0.3	0.5	0.1	0.1	0.0	0.1	0.6	0.1	0.1	0.2	0.2	0.0	0.0	-0.1	0.2	0.2	0.2	0.3	-0.2
1:00p							0.1	0.5	0.1	0.3	0.2	0.1	0.4	0.0	0.0	0.1	0.0	-0.1	0.3	0.1	-0.1	0.1	0.3	0.0	0.3	0.0	0.3	0.0	0.2	0.1	-0.1
2:00p							0.3	0.3	0.1	0.1	0.1	0.1	0.4	0.0	0.0	0.2	-0.3	0.0	0.3	0.2	0.3	0.0	0.3	0.1	0.0	0.2	0.2	0.2	0.5	0.1	0.0
3:00p							0.5	-0.3	0.1	0.2	0.2	0.3	0.6	0.0	0.1	0.1	0.0	-0.1	0.4	0.0	0.3	0.2	0.3	0.1	0.1	0.2	0.3	0.3	0.2	0.4	0.4
4:00p							0.2	0.0	0.2	0.2	0.1	0.1	0.7	0.1	0.2	0.1	0.2	-0.2	0.4	-0.2	0.2	0.4	0.1	0.3	0.2	0.2	0.4	0.4	0.2	0.3	0.2
5:00p							0.0	-0.2	0.3	0.2	0.2	0.2	0.4	0.0	0.2	0.1	0.0	0.0	0.5	0.0	0.2	0.4	0.3	0.2	0.1	0.3	0.2	0.4	0.2	0.4	0.1
6:00p							0.0	-0.5	0.1	0.1	0.3	0.3	0.1	0.1	0.3	0.1	0.3	0.1	0.5	0.0	0.2	0.3	0.2	0.4	0.2	0.2	0.3	0.4	0.4	0.4	0.0
7:00p							0.1	-0.9	0.0	0.4	0.3	0.4	0.2	0.2	0.4	0.2	0.5	0.4	0.5	0.1	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.4	0.0
8:00p							0.1	-0.8	0.1	0.3	0.2	0.1	0.1	0.2	0.3	0.3	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
9:00p							0.1	0.1	0.1	0.2	0.4	0.1	0.1	0.2	0.3	0.4	0.5	0.3	0.0	0.1	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.5
10:00p							0.0	0.3	0.1	0.1	0.3	0.2	0.1	0.3	0.3	0.4	0.4	0.4	0.0	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.4
11:00p							0.3	-0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.4	0.4	0.4	0.2	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.3
Max.	0.50	0.50	0.30	0.40	0.40	0.40	0.70	0.50	0.40	0.40	0.40	0.40	0.50	0.40	0.40	0.40	0.50	0.40	0.60	0.30	0.40	0.40	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.40	0.50
Min.	0.00	-0.90	-0.10	0.10	0.10	0.10	0.10	0.00	0.00	-0.10	-0.30	-0.20	-0.30	-0.20	0.00	-0.10	-0.20	0.00	-0.20	-0.10	0.00	0.00	0.00	0.00	-0.10	0.00	0.20	0.10	0.10	-0.30	
Avg.	0.15	0.03	0.09	0.20	0.23	0.18	0.25	0.18	0.22	0.20	0.24	0.19	0.28	0.15	0.23	0.27	0.20	0.20	0.22	0.28	0.31	0.27	0.20	0.20	0.22	0.28	0.31	0.27	0.26	0.16	

Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), June 2000

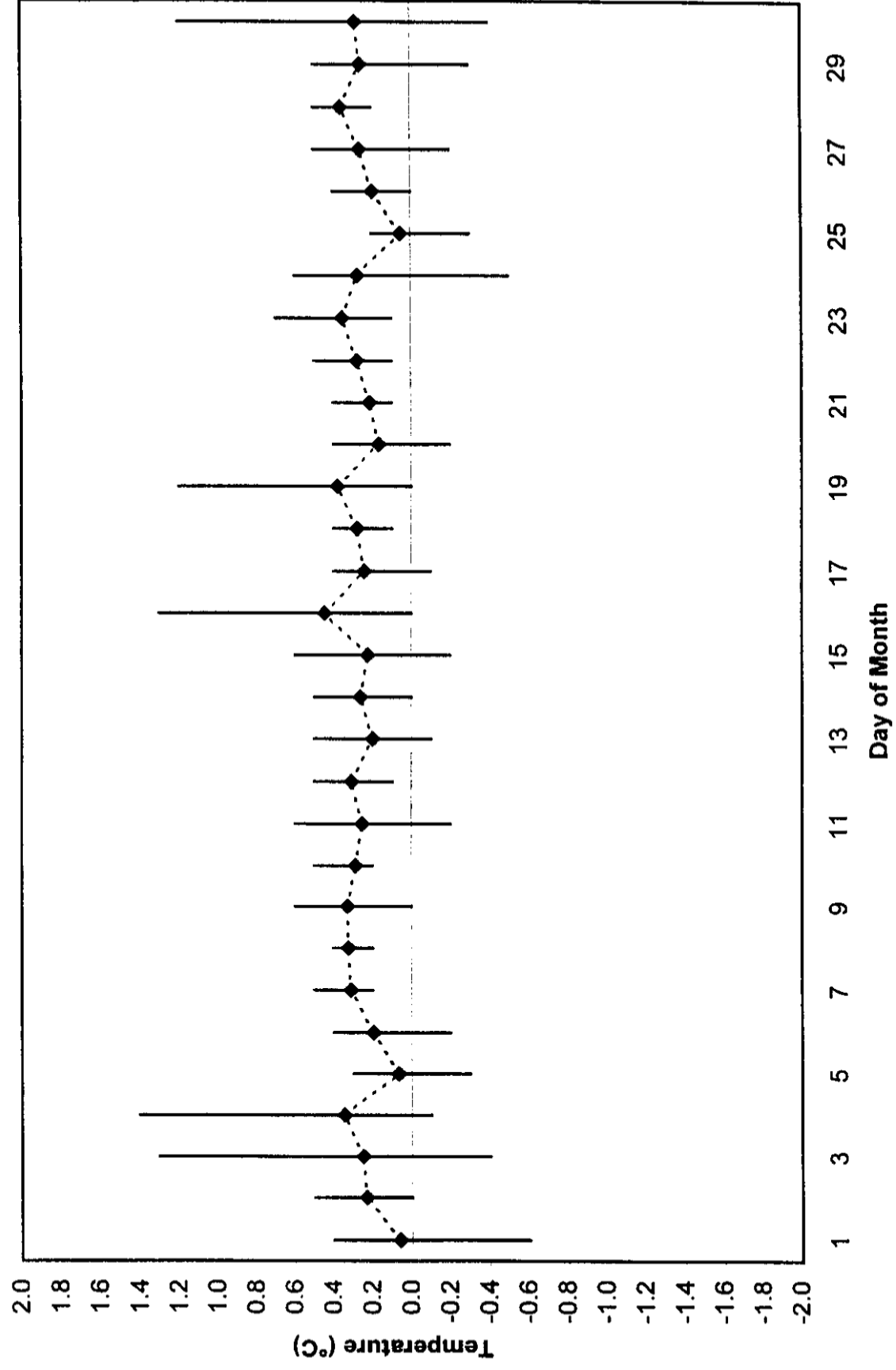


Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), July 2000

Time	Day of Month																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
12:00a	0.3	0.2	0.5	0.2	0.2	0.4	0.3	0.2	0.3	0.2	0.3	0.2	0.4	0.3	0.4	0.3	0.4	0.4	0.3	0.0	0.2	0.4	0.4	0.2	-0.3	0.2	0.3	0.4	0.3	0.4	0.4	
1:00a	0.3	0.3	0.4	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.5	0.5	0.3	-0.1	0.3	0.4	0.3	0.3	0.3	0.4	
2:00a	0.2	0.2	0.4	0.2	0.2	0.4	0.4	0.2	0.4	0.3	0.4	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.3	0.1	0.3	0.3	0.3	0.3	0.4	0.4	
3:00a	0.3	0.3	0.2	0.2	0.1	0.4	0.5	0.4	0.3	0.2	0.5	0.2	0.3	0.2	0.3	0.4	0.3	0.4	0.1	0.3	0.3	0.3	0.3	0.4	0.1	0.3	0.2	0.2	0.4	0.5	0.3	
4:00a	0.2	0.2	0.3	0.3	0.1	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.2	0.4	0.3	0.3	0.4	0.1	0.4	0.2	0.4	0.3	0.3	0.1	0.2	0.3	0.2	0.4	0.4	0.3	
5:00a	0.1	0.2	0.3	0.2	0.1	0.4	0.4	0.4	0.4	0.3	0.6	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.1	0.4	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.4	0.4	
6:00a	0.2	0.2	0.2	0.2	0.0	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.3	0.2	0.3	0.1	0.3	0.3	0.3	0.2	0.1	0.4	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.2
7:00a	0.1	0.0	0.3	0.1	0.0	0.3	0.3	0.4	0.2	0.3	0.4	0.3	0.2	0.1	0.2	0.1	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.1	0.2	0.3	0.2	0.4	0.3	0.3	0.1	
8:00a	0.0	0.1	0.2	0.0	0.1	0.2	0.2	0.4	0.3	0.2	0.3	0.3	0.2	0.1	0.0	0.0	0.1	0.3	0.1	0.2	0.2	0.2	0.1	0.0	0.1	0.4	0.3	0.5	0.2	0.3	0.1	
9:00a	-0.1	0.0	0.3	0.0	0.0	0.0	0.2	0.4	0.2	0.2	0.2	0.1	0.2	0.0	0.1	0.0	0.0	0.3	0.1	0.2	0.1	0.2	0.2	0.3	0.0	0.3	0.2	0.5	0.3	0.2	-0.1	
10:00a	-0.1	0.1	0.1	0.0	-0.1	0.0	0.2	0.4	0.2	0.2	0.4	0.1	-0.1	0.1	-0.1	0.2	0.1	0.2	0.3	0.2	0.1	0.1	0.3	0.1	0.2	0.2	0.1	0.4	0.4	0.1	0.0	
11:00a	-0.1	0.1	-0.1	0.0	-0.1	0.1	0.2	0.4	0.2	0.3	0.3	0.2	*	0.1	0.1	0.0	-0.1	0.1	0.6	-0.1	0.1	0.1	0.3	0.2	0.0	0.1	0.1	0.4	0.3	0.0	-0.3	
12:00p	-0.3	0.2	-0.3	0.0	-0.3	0.2	0.2	0.4	0.0	0.3	0.2	0.3	0.1	0.2	0.0	0.7	0.0	0.1	0.8	-0.2	0.2	0.2	0.2	0.3	0.4	0.1	0.0	0.1	0.3	0.4	-0.3	0.1
1:00p	-0.3	0.2	0.1	-0.1	-0.2	0.0	0.3	0.4	0.1	0.3	0.2	0.3	0.0	0.2	-0.2	0.7	0.1	0.3	1.2	-0.1	0.1	0.2	0.4	0.4	0.1	0.0	-0.2	0.4	0.4	-0.4	0.7	
2:00p	-0.3	0.2	-0.4	0.4	-0.1	0.0	0.4	0.3	0.4	0.4	0.0	0.4	-0.1	0.3	0.0	0.5	0.1	0.3	1.0	-0.1	0.1	0.1	0.3	0.4	0.1	0.1	0.1	0.4	-0.2	0.1	1.5	
3:00p	-0.6	0.2	0.2	0.8	0.1	-0.1	0.3	0.2	0.6	0.3	-0.2	0.3	0.1	0.2	0.0	0.3	0.2	0.2	1.2	0.0	0.2	0.3	0.5	0.6	0.1	0.0	0.5	0.5	-0.2	0.0	1.0	
4:00p	-0.3	0.4	1.0	1.4	-0.1	0.0	0.3	0.3	0.5	0.3	0.1	0.4	0.1	0.3	0.3	1.3	0.3	0.1	0.4	0.1	0.2	0.1	0.7	0.5	0.1	0.0	0.4	0.4	-0.3	1.2	1.4	
5:00p	0.4	0.2	0.8	0.9	0.1	-0.2	0.5	0.3	0.6	0.3	-0.1	0.5	-0.1	0.3	0.2	0.9	0.3	0.2	0.4	0.2	0.2	0.3	0.5	0.5	0.1	0.0	0.4	0.4	-0.1	0.6	1.0	
6:00p	0.1	0.3	1.3	0.9	0.1	-0.1	0.3	0.3	0.5	0.3	0.0	0.4	0.1	0.3	0.4	0.7	0.4	0.2	0.0	0.3	0.2	0.3	0.3	0.5	0.0	0.2	0.4	0.3	0.2	0.3	1.0	
7:00p	0.3	0.3	-0.1	0.9	0.1	0.3	0.3	0.3	0.5	0.4	0.1	0.4	0.2	0.5	0.6	0.7	0.4	0.3	0.4	0.3	0.3	0.4	0.6	0.6	-0.1	0.1	0.4	0.4	0.2	0.3	1.1	
8:00p	0.4	0.4	-0.1	0.6	0.2	0.4	0.3	0.3	0.3	0.2	0.3	0.4	0.3	0.5	0.4	0.9	0.4	0.3	0.0	0.3	0.4	0.1	0.3	0.3	-0.1	0.3	0.4	0.3	0.5	0.1	0.6	
9:00p	0.3	0.4	0.0	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.7	0.4	0.3	0.0	0.3	0.3	0.3	0.5	0.4	0.0	0.3	0.3	0.3	0.3	0.4	0.6	
10:00p	0.1	0.5	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.5	0.4	0.4	0.6	0.3	0.3	0.0	0.2	0.4	0.3	0.5	-0.2	0.0	0.3	0.3	0.3	0.4	0.4	0.4	
11:00p	0.3	0.4	0.2	0.3	0.3	0.4	0.2	0.3	0.2	0.2	0.3	0.4	0.3	0.4	0.3	0.4	0.4	0.3	0.9	0.2	0.3	0.4	0.2	-0.5	0.1	0.2	0.3	0.3	0.4	0.5	0.4	
Max.	0.40	0.50	1.30	1.40	0.30	0.40	0.50	0.40	0.60	0.50	0.60	0.50	0.50	0.60	1.30	0.40	0.40	1.20	0.40	0.40	0.50	0.70	0.60	0.20	0.40	0.50	0.50	0.50	1.20	1.50		
Min.	-0.60	0.00	-0.40	-0.10	-0.30	-0.20	0.20	0.20	0.00	0.20	-0.20	0.10	-0.10	0.00	-0.20	0.00	-0.10	0.10	0.00	-0.20	0.10	0.10	0.10	-0.50	-0.30	0.00	-0.20	0.20	-0.30	-0.40	-0.30	
Avg.	0.06	0.23	0.25	0.35	0.07	0.20	0.31	0.33	0.33	0.29	0.25	0.31	0.20	0.26	0.23	0.45	0.24	0.28	0.38	0.17	0.21	0.28	0.35	0.28	0.05	0.20	0.26	0.36	0.26	0.28	0.49	

* Service point (missing data)

Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), July 2000



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), August 2000

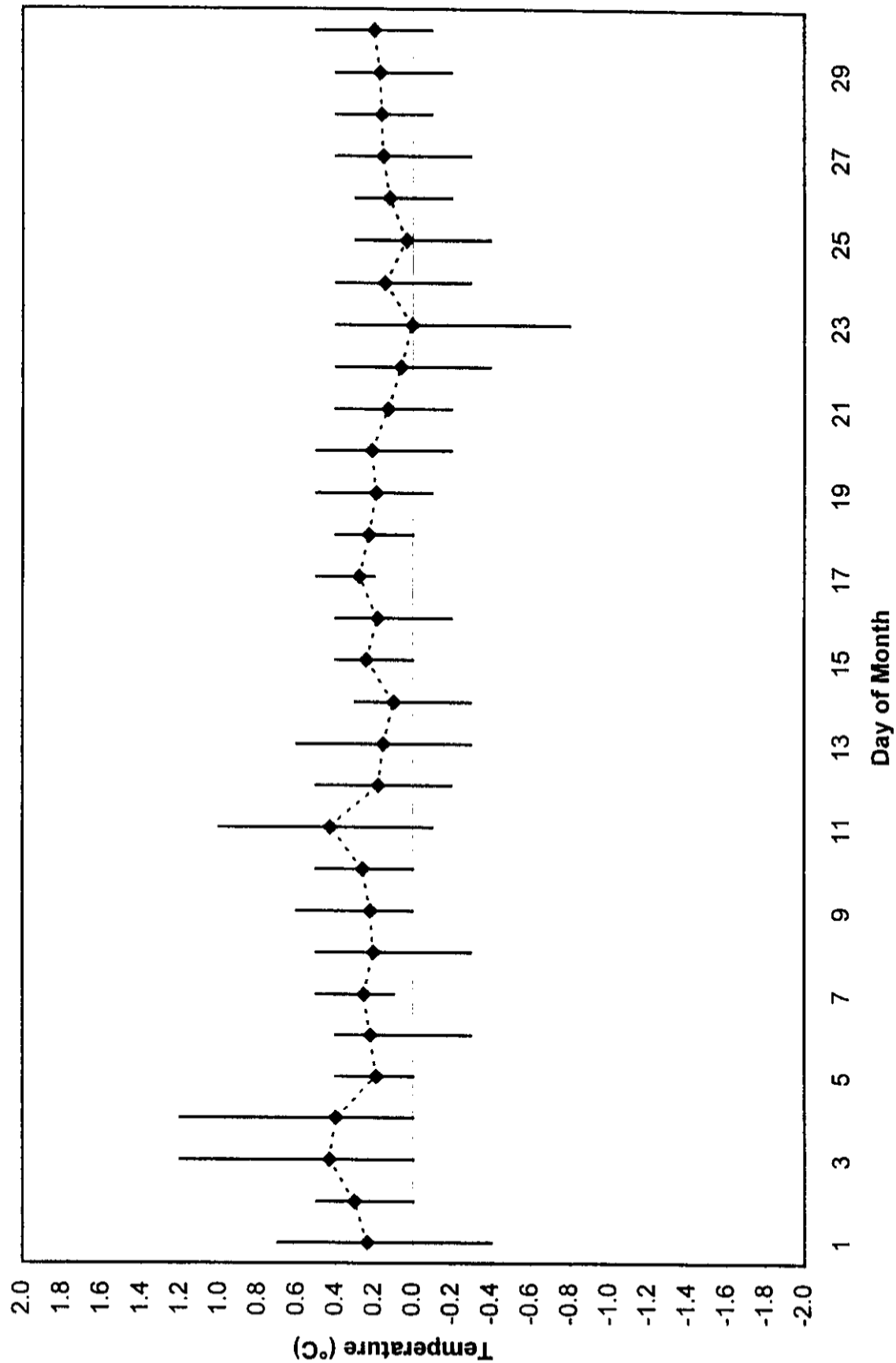
Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	0.5	0.4	0.3	0.4	0.3	0.3	0.4	0.5	0.2	0.4	0.4	0.5	0.2	0.3	0.3	0.4	0.5	0.2	0.4	0.1	0.3	0.2	0.1	0.3	-0.4	0.3	0.4	0.2	0.2	0.4	0.3
1:00a	0.5	0.5	0.3	0.3	0.4	0.2	0.4	0.3	0.0	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.2	0.4	0.3	0.4	0.0	0.0	0.4	-0.2	0.3	0.3	0.2	0.4	0.4	0.2
2:00a	0.4	0.4	0.3	0.3	0.4	0.3	0.4	0.4	0.2	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.3	0.2	0.3	0.4	0.1	0.2	0.4	0.1	0.3	0.3	0.2
3:00a	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.1	0.3	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.5	0.3	0.4	0.2	0.4	0.3	0.2	0.3	0.4	0.2	0.3	0.4	0.2
4:00a	0.4	0.5	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.2	0.4	0.4	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.2
5:00a	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.5	0.2
6:00a	0.3	0.4	0.2	0.4	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.4	0.3
7:00a	0.3	0.4	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.1
8:00a	0.0	0.3	0.1	0.1	0.0	0.2	0.3	0.3	0.2	0.1	-0.1	0.1	0.2	0.0	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.0	0.1	0.2	0.1	0.2	0.2	0.3	0.2	0.1
9:00a	0.0	0.3	0.0	0.1	0.2	0.2	0.3	0.2	0.2	0.1	-0.1	-0.1	0.2	0.0	0.2	0.1	0.2	0.0	0.1	0.1	0.1	-0.1	-0.1	0.0	0.2	0.1	-0.1	0.2	0.2	0.0	0.2
10:00a	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.2	0.2	0.1	0.0	-0.2	0.1	-0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.3	-0.1	-0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0
11:00a	-0.1	0.1	0.5	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	-0.2	0.0	0.0	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.1	-0.2	0.0	-0.2	-0.1	0.1	0.1	0.0	0.1	0.2
12:00p	0.4	0.0	0.5	0.1	0.2	0.2	0.1	0.0	0.2	0.4	0.0	-0.3	0.0	0.0	0.0	0.0	0.3	0.0	-0.1	0.1	0.0	-0.1	-0.4	-0.1	0.0	0.0	0.1	0.1	-0.1	0.0	0.3
1:00p	0.7	0.1	0.5	0.1	0.0	0.2	0.1	-0.1	0.1	0.1	0.5	-0.1	-0.2	0.1	0.1	0.0	0.2	0.0	-0.1	0.2	0.0	-0.1	-0.7	0.1	0.1	0.0	0.2	0.2	-0.2	-0.1	0.1
2:00p	0.3	0.1	0.7	0.7	0.0	0.4	0.1	-0.2	0.0	0.1	0.9	-0.1	-0.3	0.1	0.1	-0.1	0.2	0.1	0.2	0.3	0.0	0.1	-0.8	-0.3	0.1	0.1	0.2	0.0	-0.2	0.0	0.3
3:00p	0.1	0.3	0.5	0.8	0.0	0.3	0.1	-0.2	0.1	0.2	0.8	0.2	-0.3	0.1	0.1	-0.2	0.3	0.1	0.2	0.3	0.1	-0.1	-0.5	0.0	-0.1	0.1	0.1	0.0	-0.1	*	0.1
4:00p	0.1	0.2	0.5	0.8	0.0	-0.3	0.1	0.3	0.2	0.3	1.0	0.1	-0.1	0.2	0.1	0.0	0.3	0.2	0.1	0.4	-0.2	0.2	-0.4	0.1	0.1	-0.2	0.2	0.2	-0.2	-0.1	0.1
5:00p	-0.4	0.3	0.5	0.7	0.1	0.0	0.1	-0.1	0.2	0.0	0.8	0.2	-0.1	0.2	0.2	-0.1	0.2	0.2	0.0	0.4	-0.1	0.1	-0.1	0.2	-0.1	0.0	0.3	0.1	0.1	0.0	0.4
6:00p	0.0	0.3	0.3	1.2	0.1	0.2	0.1	-0.3	0.6	0.3	1.0	0.1	-0.1	-0.3	0.3	0.2	0.3	0.3	0.3	-0.2	-0.1	0.4	0.1	0.3	-0.1	0.0	-0.1	-0.1	0.2	0.1	-0.4
7:00p	0.0	0.4	0.9	0.8	0.2	0.2	0.3	0.5	0.4	0.5	1.0	0.3	0.1	0.0	0.3	0.2	0.2	0.3	0.3	-0.2	-0.1	-0.2	0.3	0.3	-0.2	0.0	-0.3	0.1	0.4	0.3	-0.5
8:00p	0.4	0.4	1.2	1.0	0.2	0.3	0.2	0.5	0.4	0.5	0.2	0.3	0.6	-0.1	0.4	0.3	0.2	0.3	0.3	0.1	0.0	-0.1	0.2	0.2	0.2	0.0	-0.2	0.3	0.3	0.2	0.4
9:00p	0.4	0.4	0.9	0.0	0.3	0.3	0.3	0.4	0.2	0.5	0.6	0.3	0.6	-0.1	0.3	0.3	0.3	0.3	-0.1	0.2	0.1	-0.4	0.2	0.1	0.0	0.1	-0.1	0.2	0.3	0.2	0.4
10:00p	0.2	0.3	0.7	0.1	0.4	0.4	0.3	0.3	0.4	0.3	0.4	0.3	0.5	0.0	0.3	0.4	0.3	0.4	-0.1	0.3	0.2	-0.3	0.4	0.1	0.0	0.2	0.0	0.2	0.3	0.3	0.7
11:00p	0.4	0.3	0.3	0.3	0.4	0.3	0.5	0.2	0.4	0.3	0.6	0.3	0.5	0.3	0.3	0.3	0.3	0.3	0.0	0.3	0.0	-0.3	0.3	-0.1	0.1	0.3	0.2	0.2	0.4	0.3	0.5

Max.	0.70	0.50	1.20	1.20	0.40	0.40	0.50	0.60	0.50	1.00	0.50	0.60	0.30	0.40	0.40	0.50	0.40	0.50	0.50	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.40	0.40	0.40	0.50	0.70
Min.	-0.40	0.00	0.00	0.00	0.00	-0.30	0.10	-0.30	0.00	0.00	-0.10	-0.20	-0.30	-0.30	0.00	-0.20	0.20	0.00	-0.10	-0.20	-0.20	-0.40	-0.80	-0.30	-0.40	-0.20	-0.30	-0.10	-0.20	-0.10	-0.50
Avg.	0.24	0.30	0.43	0.40	0.19	0.22	0.25	0.20	0.22	0.26	0.43	0.18	0.15	0.10	0.24	0.18	0.28	0.23	0.19	0.21	0.13	0.06	0.00	0.15	0.03	0.12	0.15	0.16	0.17	0.20	0.19

* Service point (missing data)

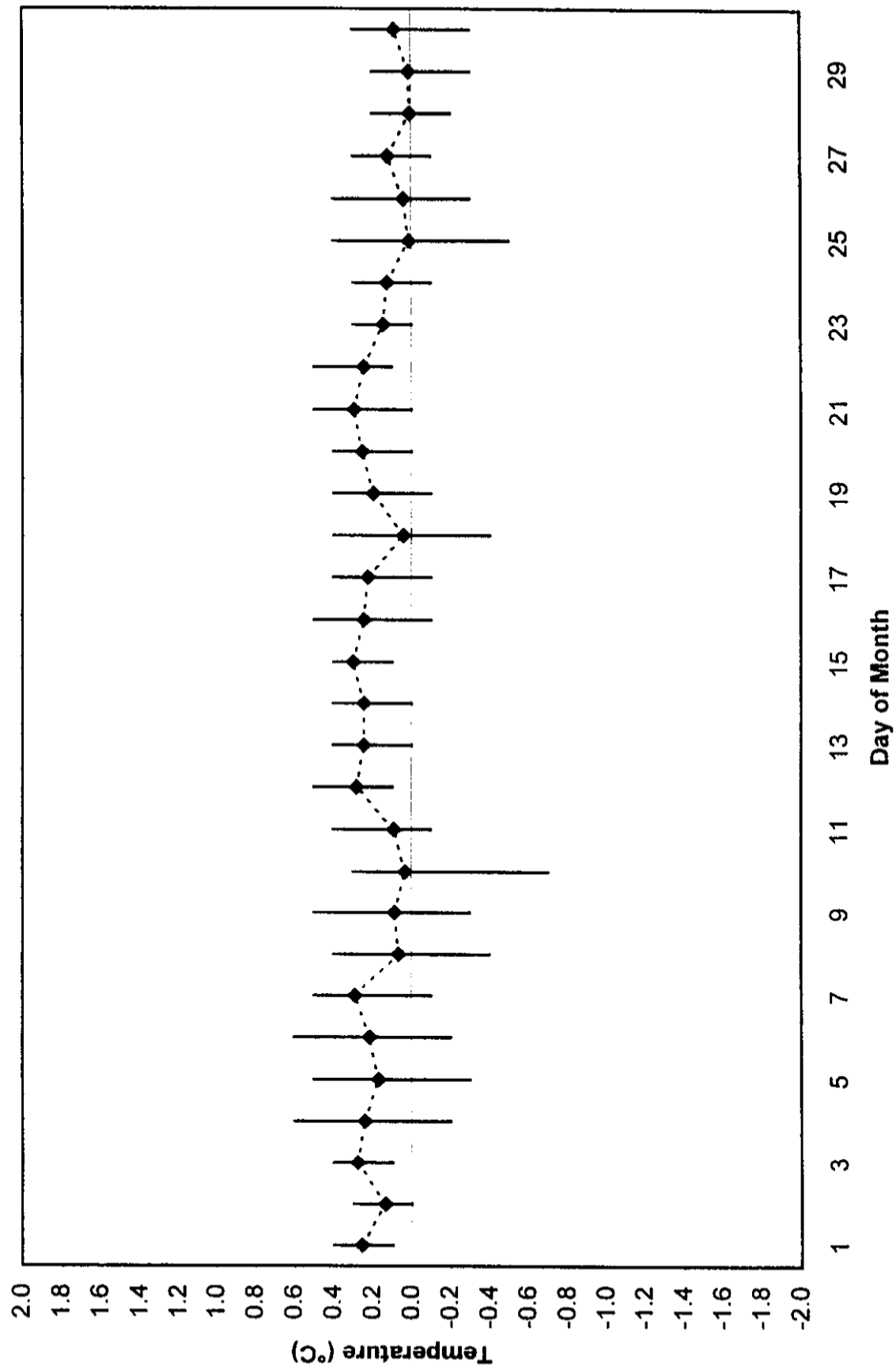
Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), Aug. 2000



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), September 2000

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	0.4	0.1	0.3	0.3	0.4	0.6	0.5	0.4	0.3	0.3	-0.1	0.4	0.4	0.3	0.4	0.4	0.3	0.4	-0.1	0.3	0.3	0.5	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2
1:00a	0.2	0.1	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.3	0.0	0.3	0.4	0.3	0.4	0.5	0.3	0.4	0.1	0.3	0.4	0.3	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.2
2:00a	0.3	0.2	0.4	0.3	0.4	0.4	0.4	0.3	0.5	0.3	0.1	0.3	0.3	0.4	0.4	0.4	0.3	0.4	0.2	0.2	0.4	0.3	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.2
3:00a	0.3	0.2	0.4	0.3	0.4	0.4	0.3	0.4	0.3	0.1	0.1	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.1	0.3	0.4	0.4	0.1	0.3	0.2	0.1	0.2	0.0	0.2	0.2
4:00a	0.3	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.3	0.4	0.2	0.3	0.4	0.3	0.2	0.4	0.2	0.3	0.3	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.2
5:00a	0.2	0.1	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.1	0.2	0.4	0.3	0.4	0.4	0.3	0.2	0.3	0.2	0.2	0.4	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2
6:00a	0.4	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.2	0.3	-0.1	0.4	0.2	0.3	0.4	0.4	0.3	0.2	0.3	0.2	0.4	0.3	0.2	0.1	0.2	0.0	0.1	0.0	0.2	0.2
7:00a	0.3	0.1	0.4	0.3	0.4	0.3	0.3	0.4	0.2	0.3	0.0	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.1	0.1	0.1	0.1	-0.1	0.1	0.2
8:00a	0.2	0.1	0.2	0.1	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.3	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.4	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.2
9:00a	0.3	0.0	0.2	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.3	0.3	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.3	0.2	0.0	0.1	-0.1	0.0	0.1	0.0	0.0	0.1
10:00a	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.0	0.0	0.1	0.0	0.2	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.0	0.0	-0.2	-0.2	0.0	0.0	0.0	-0.1
11:00a	0.2	0.0	0.2	0.0	0.0	0.0	0.3	-0.2	0.0	0.0	-0.1	0.2	0.1	0.0	0.2	0.1	0.1	-0.2	0.1	0.2	0.1	0.2	0.2	0.0	-0.1	-0.3	0.0	-0.1	-0.1	-0.2
12:00p	0.2	0.0	0.1	-0.1	0.0	0.0	0.3	-0.3	-0.2	0.2	-0.1	0.2	0.0	0.1	0.2	-0.1	0.1	-0.3	0.3	0.1	0.0	0.1	0.0	0.0	-0.2	-0.1	-0.1	-0.1	-0.3	0.2
1:00p	0.3	0.0	0.1	-0.1	-0.3	0.0	0.2	-0.2	-0.1	0.0	-0.1	0.1	0.0	0.1	0.1	-0.1	0.1	-0.2	0.1	0.0	0.0	0.1	0.1	0.0	-0.3	-0.1	-0.1	-0.1	-0.2	0.1
2:00p	0.2	0.0	0.1	-0.2	-0.3	-0.2	0.3	-0.4	0.1	-0.5	0.1	0.1	0.0	0.2	0.1	0.1	0.0	-0.2	0.1	0.1	0.1	0.1	0.1	-0.1	-0.4	-0.2	-0.1	-0.2	-0.2	0.2
3:00p	0.1	0.0	0.2	0.0	-0.3	-0.1	0.1	-0.2	-0.1	-0.7	0.1	0.2	0.1	0.1	0.2	0.1	-0.1	-0.1	0.0	0.3	0.1	0.3	0.1	0.0	-0.5	0.0	0.0	-0.2	-0.3	0.3
4:00p	0.3	0.1	0.3	0.0	-0.1	0.0	-0.1	0.1	-0.3	-0.3	0.1	0.1	0.2	0.2	0.3	0.0	0.0	-0.1	0.2	0.3	0.2	0.2	0.2	0.1	-0.4	0.0	0.2	0.0	-0.2	0.3
5:00p	0.3	0.3	0.4	0.4	0.0	0.1	0.1	-0.1	-0.3	0.1	0.1	0.2	0.4	0.2	0.3	0.2	0.4	-0.4	0.3	0.3	0.3	0.2	0.2	0.2	-0.1	0.2	0.2	-0.1	-0.1	0.0
6:00p	0.3	0.2	0.3	0.4	0.0	0.1	0.3	0.0	-0.3	0.2	0.0	0.2	0.4	0.2	0.4	0.3	0.3	-0.3	0.2	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.1
7:00p	0.3	0.1	0.4	0.6	0.3	0.3	0.4	-0.1	0.1	0.0	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.0	0.4	0.2	0.4	0.2	0.2	0.2	0.0	0.1	0.2	0.1	-0.1	-0.1
8:00p	0.3	0.3	0.4	0.5	0.2	0.3	0.4	0.4	0.0	0.0	0.4	0.3	0.3	0.3	0.4	0.5	0.4	0.0	0.3	0.4	0.4	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.0	-0.2
9:00p	0.2	0.3	0.3	0.5	0.3	0.3	0.3	-0.4	0.1	0.2	0.2	0.3	0.4	0.2	0.4	0.3	0.4	-0.2	0.4	0.4	0.4	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	-0.1
10:00p	0.2	0.3	0.2	0.4	0.5	0.3	0.5	-0.1	0.2	-0.2	0.3	0.5	0.3	0.3	0.4	0.3	0.4	0.0	0.3	0.3	0.5	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.1	-0.3
11:00p	0.2	0.3	0.3	0.5	0.4	0.3	0.4	0.0	0.1	-0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.4	0.0	0.3	0.4	0.4	0.2	0.2	0.3	0.4	0.4	0.2	0.1	0.1	0.1
Max.	0.40	0.30	0.40	0.60	0.50	0.60	0.50	0.40	0.50	0.30	0.40	0.50	0.40	0.40	0.40	0.50	0.40	0.40	0.40	0.40	0.50	0.50	0.30	0.30	0.40	0.40	0.30	0.20	0.20	0.30
Min.	0.10	0.00	0.10	-0.20	-0.30	-0.20	-0.10	-0.40	-0.30	-0.70	-0.10	0.10	0.00	0.00	0.10	-0.10	-0.10	-0.40	-0.10	0.00	0.00	0.10	0.00	-0.10	-0.50	-0.30	-0.10	-0.20	-0.30	-0.30
Avg.	0.26	0.14	0.28	0.24	0.17	0.22	0.29	0.07	0.09	0.03	0.09	0.28	0.25	0.25	0.30	0.25	0.23	0.04	0.20	0.25	0.30	0.25	0.15	0.13	0.01	0.04	0.12	0.01	0.01	0.09

Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), Sept. 2000



APPENDIX H

Agency Comments to the Draft Annual Report for 2000 Monitoring

**NATURAL RESOURCES
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Refer to: 4202.2.76

January 31, 2001

FEB - 1 2001

Mr. Kent Premo
White Water Associates, Inc.
429 River Lane, Box 27
Amasa, MI 49903

Dear Mr. Premo:

Subject: City of Crystal Falls Hydroelectric Project (FERC No. 11402)
Comments on the draft report for the Water Quality Monitoring
Study

The Michigan Department of Natural Resources (MDNR) is in receipt of your draft copy of the Water Quality Monitoring study dated January 29, 2001. In this report, results for the City of Crystal Falls Hydroelectric Project Water Quality Monitoring Plan were submitted for data collected during 2000.

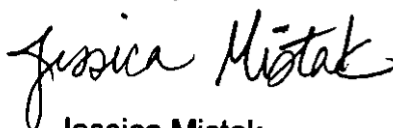
Monitoring methods and results were in compliance with the Federal Energy Regulatory Commission (FERC) Order Approving Water Quality Monitoring Plan. The Crystal Falls hydroelectric project did not influence DO or water temperature beyond limits specified by the state of Michigan. Dissolved oxygen measurements taken upstream and downstream of the dam always exceeded 5.0 mg/L, while differences in temperature measurements at the same locations varied less than 2°C at all times. Because of time constraints, water temperature and DO profiles were not collected for February. An interim report should be sent to MDNR detailing the February 2001 profiles, with the final results to be included in the 2001 study report.

As a result of this compliance, White Water Associates, Inc. has asked for the relaxation of the weekly download of data requirement. It is their opinion that visits every two weeks would be adequate to measure changes in conditions and ensure proper operation without risking large amounts of data loss. MDNR agrees that it is appropriate to relax downloading of data to become bi-weekly. However, it should be stipulated that bi-weekly downloading is appropriate only if no problems with data collection are encountered. If problems such as unusual DO drift or non-compliance should occur, MDNR requests the licensee return to downloading data on a weekly basis.

Finally, please note that FERC orders stipulate annual reports are to be provided to the agencies by December 15 of each year of monitoring. The 2000 monitoring report is dated January 29, 2001 and was not received until January 31, 2001. Although MDNR was able to complete a timely review this year, it would be appreciated if an increased effort was made to ensure the reports are received by the December 15 deadline.

Thank you for the opportunity to comment. If you have any questions, please contact me.

Sincerely,

A handwritten signature in black ink that reads "Jessica Mistak". The signature is fluid and cursive, with the first name "Jessica" and last name "Mistak" clearly legible.

Jessica Mistak
Habitat Protection Unit
Fisheries Division
906/249-1611

cc: Dr. Kurt Newman, MDNR, Supervisor, HPU
Mr. Jim Fossum, USFWS

In

To: whitewtr@up.net
Cc: neumankr@state.mi.us

To: Mr. Kent Premo, White Water Associates, Inc. Amasa, MI
From: Jim Fossum, USFWS, Ecological Services Field Office, Green Bay, WI

Subject: Review of the Water Quality Monitoring Report -2000 monitoring

Your January 29, 2001 letter to us requested U.S. Fish and Wildlife Service review of the subject report for the Crystal Falls Hydroelectric Project (FERC No. 11402). We will largely defer to the Michigan Department of Natural Resources on water quality issues, however, after report review, the FWS did not discern any significant problems with water or temperature levels in the monitoring data. Therefore, we have no further comments.

Thank you for the opportunity to review the report.

James D. Fossum